



**AURANGABAD SMART CITY DEVELOPMENT  
CORPORATION LIMITED (ASCDCL)  
MAHARASHTRA (INDIA)**

**REQUEST FOR PROPOSAL**

**FOR**

**CONSTRUCTION OF SMART CITY BUS DEPOT  
AT MUKUNDWADI, AURANGABAD**

**Aurangabad Smart City Development Corporation Limited (ASCDCL)**

# CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

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NO.	PARTICULARS	DETAILS
1	Name of the Authority	Aurangabad Smart City Development Corporation Ltd (ASCDCL)
2	Name of the Work	Construction of Smart City Bus Depot at Mukundwadi, Aurangabad
3	Method of Selection	Least Cost method.
4	Date of Issuance	06/ 02/2021
5	Issuing Authority	<b>Chief Executive Officer,</b> Aurangabad Smart City Development Corporation Ltd
6	Authority Contact Person	Assistant Project Manager ASCDCL, War Room, Ambedkar Research Center, Near Amkhas Maidan, Aurangabad-431001
7	Authority Address/Email for Seeking Clarifications on RFP	ASCDCL, War Room, Ambedkar Research Center, Near Amkhas Maidan, Aurangabad- 431001. Email: <a href="mailto:hq@aurangabadsmartcity.in">hq@aurangabadsmartcity.in</a>
8	Authority Website	<a href="http://www.mahatenders.gov.in">www.mahatenders.gov.in</a>
9	Last Date for Submissions of Queries/Clarifications	11/02/2021 by 4:00 PM
10	Date, Time and Venue of Pre-Bid Meeting	12 /02/2021 at 11:00 AM Venue: ASCDCL, War Room, Ambedkar Research Center, Near Amkhas Maidan, Aurangabad-431001
11	Date and Time for Submission of Bid including Technical and Financial Bids	22/02/2021 by 4:00 PM
12	Date, Time, & Venue for Submission of Hard Copy of Technical Bid	23/02/2021 by 4:00 PM Venue: ASCDCL, War Room, Ambedkar Research Center, Near Amkhas Maidan, Aurangabad-431001
13	Date and Time of Opening of Technical Bid	23/02/2021 at 4:00 PM
14	Date, Time, and Venue of Opening of Financial Bid	Technically qualified bidders shall be notified 24 hours in advance of financial bid opening
15	Bid Validity	180 days
16	Cost of Tender Document	INR 15000 + GST
17	Bid Security/EMD	Rs.11,30,000/-
18	Performance Security	5% of the Contract Value
19	Work completion schedule	12 months (Including Monsoon)
20	Defect liability period	3 years
21	Estimated Cost of Work	Rs.11,25,48,454/- (Rupees Eleven Crore Twenty Five Lakhs Fouty Eight Thousand Four Hundred and Fifty Four Only)

Sd/-  
Chief Executive Officer  
Aurangabad Smart City Development Corporation Ltd.

**DISCLAIMER**

1. The information contained in this Request for Proposal document (“RFP”) or subsequently provided to tenderers/Bidder(s), whether verbally or in documentary or any other form by or on behalf of Aurangabad Smart City Development Corporation Limited (ASCDCL) or any of its employees or advisors, is provided to the tenderers/Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided. This RFP is not an Agreement and is neither an offer nor invitation by ASCDCL to the prospective Bidders (tenderers) or any other person.
2. The purpose of this RFP is to provide interested parties with information that may be useful to them in making their financial offers (Bids) pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by ASCDCL in relation to the Project/work. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require.
3. This RFP may not be appropriate for all persons, and it is not possible for ASCDCL, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in the tendering (Bidding) Documents may not be complete, accurate, adequate or correct. Each Bidder 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 RFP and obtain independent advice from appropriate sources.
4. Information provided in this RFP to the Bidder(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. ASCDCL accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein. ASCDCL, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder(tenderer) 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 RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way for participation in this Bid(tender) Stage.
5. ASCDCL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP. ASCDCL 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 RFP. The issue of this RFP does not imply that ASCDCL is bound to select a Bidder for the Project and ASCDCL reserves the right to reject all or any of the Bidders or Bids without assigning any reason whatsoever.
6. The Bidder shall bear all its costs associated with or relating to the preparation and submission of its Bid including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which

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may be required by the Authority (Aurangabad Smart City Development Corporation Ltd ) or any other costs incurred in connection with or relating to its Bid. All such costs and expenses will remain with the Bidder and the Authority (Aurangabad Smart City Development Corporation Ltd) shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Bid, regardless of the conduct or outcome of the Bidding Process.

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### DETAILED TENDER NOTICE

Online percentage rate basis Tenders in B -1 Form are invited for the following work from the eligible contractors having experience of such type of work by the CEO, Aurangabad Smart City Development Corporation Limited, Maharashtra on the e-Tendering portal of Government of Maharashtra: <https://mahatenders.gov.in>.

*Note: In order to participate in e-tendering process, it is mandatory for new contractors (first time users of this website) to complete the Online Registration Process for the e-Tendering website. For guidelines, kindly refer to Bidders Manual Kit documents provided on the website.*

**NAME OF WORK:** Construction of Smart City Bus Depot at Mukundwadi, Aurangabad

#### e-Tender Schedule

Sr. No.	Name of Work	Construction of Smart City Bus Depot at Mukundwadi, Aurangabad
1.	Period for Downloading Bidding Documents	<b>As per e-tender schedule uploaded on e-portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a></b>
2.	Time, Date & Venue of Pre-Bid Meeting/Conference	<b>12/02/2021 at 11:00 hrs in the office of ASCDCL, Aurangabad (Maharashtra).</b>
3.	Last Date & Time for Closing of Bids	<b>As per e-tender schedule uploaded on e-portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a></b>
4.	Time, Date & Place of Opening of Bids	<b>As per e-tender schedule uploaded on e-portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a></b>
5.	Officer Inviting Bids	<b>Chief Executive Officer Aurangabad Smart City Development Corporation Ltd</b>
6.	<b>Physical Submission of Hard Copy</b>	1. Earnest Money (Bid Security) and other requisite documents forming part of the Technical Bid shall also be submitted physically by the Bidder on or before 23/02/2021 up to 16.00 hours IST as specified in NIT after the Control Transfer of Bid ("Control Transfer"). 2. Price bid (Financial bid) shall only be submitted online as specified in NIT.
7.	Place of Physical Submission of Hard Copy	In the office of ASCDCL, Aurangabad

**Note;**



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1. The complete bid documents can be viewed / downloaded from e-procurement portal of the Government <https://mahatenders.gov.in> from 06/02/2021 to 22/02/2021 up to 16:00 Hrs. IST. Bids must be submitted online only via <https://mahatenders.gov.in> on or before 22/02/2021 up to 1600 Hrs. IST. Bids received online shall be opened on 23/02/2021 at 1600 Hrs. IST.
2. Bids through any other mode shall not be entertained. However, Earnest Money(Bid Security) and other requisite documents forming part of the Technical Bid shall also be submitted physically by the Bidder on or before 23/02/2021 up to 16.00 hours IST. Subsequent corrigendum / addendum, if any, shall only be available on the website <https://mahatenders.gov.in> . Please note that the ASCDCL reserves the right to accept or reject all or any Bid without assigning any reason whatsoever.
1. Earnest Money (Bid security) and Tender fees shall be paid through: SBI Net Banking or Other Bank Internet Bank MOPS. (For any assistance please contact help desk. The fees of tender document amounting to Rs. 15000+GST is to be made through payment gateway only and will be nonrefundable.
3. Details are available online and can be seen on( <https://mahatenders.gov.in> ).
4. Online payment requires 48 hours on Bank working days for clearance and hence, payment shall be made accordingly.
5. The Earnest Money Deposit (EMD) shall be retained in the pooling account and shall be refunded to the unqualified / unsuccessful bidders after award of tender to the successful lowest bidder. The EMD(Bid security) of successful bidder shall be ultimately refunded or shall be adjusted against the security deposit after selection of the successful bidder at the time of execution of the contract. In case, the ASCDCL decided to forfeit / adjust the EMD(Bid security) amount of the bidder, the EMD(Bid security) amount in such cases shall be credited to the bank account of the Aurangabad Smart City Development Corporation Limited (ASCDCL). The mandate for EMD(Bid security) refunds / forfeit / adjustment against security deposit shall trigger from e - tender application of NIC portal.
6. The pre-bid meeting will be held on 12/02/2021 at 16:00 Hrs. in the presence of bidders who wish to attend in the office of the ASDCL.
7. The offer of the Contractor shall remain valid for acceptance for a minimum period of 180 days from the date of submission of bids and thereafter until it is extended by the Contractor(s).
8. The tender notice shall form a part of the contract agreement.
9. If the tenderer/bidder is a firm or company then they shall in their forwarding letter mention the names of all the partners of the firm or the company (as the case may be) and the name of the partner who holds the power of attorney if any, authorizing him to conduct transaction on behalf of the Firm or Company.
10. Right is reserved to revise or amend the contract documents fully or part thereof prior to the date notified for the receipt of tender. Such deviations/ amendments if any, shall be communicated in the form of corrigendum or by a letter as may be considered suitable. The above revision will not vitiate the tendering process.
11. The offer is to be submitted online. The documents shall be uploaded as required in the bid documents. The tenderer shall quote his percentage rates in words and figures "below / above". In case there is difference between percentage written in figures and words, the rates quoted in words shall prevail.
12. ASCDCL reserved the right to reject any or all tenders without assigning any reason thereof.
13. Tenders which do not fulfil all or any conditions or are incomplete in any respect are liable to be summarily rejected.

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14. In the tender process, if the lowest offer is more than 10% below the cost put to tender, the tender calling authority may obtain the detailed justification and planning of executing the work at such lower rate from the concerned contractor and based on that shall ensure the possibility of completing the work at the offered lowest rate.
15. Physical Submission:
  - a. The bidder shall submit the EMD(Bid security) and Hard Copy of Tender Documents (Technical Bid) in the manner specified in NIT after the Control Transfer of Bid ("Control Transfer").
  - b. Additional Performance Security Deposit, if offer is below 1% or more, shall be deposited by the bidders as per the provisions of clause 4.3.
16. The contractor shall submit bar chart/CPM/PERT for this work by visiting site and taking review of the work within fifteen days after issue of LOA. If contractor fails to do so then 1% amount shall be deducted from each running bill. Progress of work shall be monitored as per approved bar chart by the competent authority/Engineer in Charge/ASCDCL after scrutiny of the bar chart/CPM/PERT submitted by contractor. If progress is satisfactory, then 75% amount deducted shall be returned to the contractor and remaining 25% amount shall be forfeited by ASCDCL.
17. At any point of time during tender process, work execution period, Defect Liability Period, submitted papers/documents/applications including material purchase vouchers, test reports, challans, quantity related papers or any papers of contractor should be true, correct & if the papers submitted by Contractor are found incorrect, faulty, not true, dubious, bogus, forged etc. then relevant actions of blacklisting & criminal proceedings as per Indian Penal Code (IPC) shall be initiated against Contractor/ Partnership Firms/Private Ltd./Companies(Bidder). ASCDCL officers / Engineers / Account Officers shall not be held responsible for the papers submitted by the Contractor.
18. During Technical bid scrutiny of Envelop No.1 of tender, if contractor submits false papers / reports for fulfilment of qualifying criteria, then envelop No.2 of such contractor shall not be opened. Also, such registered contractors / non-registered contractors shall be blacklisted & information of contractor being blacklisted shall be circulated to all government and allied P. W. Departments.
19. After issuance of work order, if it is found that papers submitted / uploaded are forged, bogus, incorrect, such contractors shall be blacklisted & Criminal Proceeding as per IPC shall be initiated. If work is at initial stage, the tender of work shall be cancelled.
20. On evaluation of documents in envelope No.1, the details of Qualification / Disqualification relevant to the conditions of eligibility will be uploaded on e-tender portal online. The bidder shall raise their objection against evaluation of their own bids/ on the bids of other bidders limited to assessment of documents in envelope No.1. within 24 Hrs. from the date & time of uploading evaluation status on Portal . If no objections are raised within the period of 24 Hrs., the Financial bids / Envelope No. 2 of eligible contractors shall be opened by competent authority with prior intimation to the participant bidders.
21. If the contractor wishes to pay security deposit by Bank Guarantee after tender approval, then the bank guarantee shall be got verified.
22. The tenderer/bidder should produce necessary documents for pre-qualification as given below. Further details shall be referred in NIT;
  - 22.1 Having successfully completed the work(s) as required in NIT in his own name only.
  - 22.2 Registration/enlistment details of the firm / Contractor.
  - 22.3 The firm / Contractor should produce the document of PAN.
  - 22.4 The firm / Contractor should produce the document of GST Registration Number.
  - 22.5 The Joint Venture is not allowed for this work.
  - 22.6 The Contractor shall submit the completion certificates of similar works along with their bid.

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- 22.7 Average Annual financial turnover during the last 3 years, ending 31st March 2020 as required in NIT.
- 22.8 The Bidder must not have been blacklisted/ terminated for fraudulent practices by any of its clients including Central / State UT Government Departments/ Ministries/Government Undertakings or ASCDCL/ Government Bodies and PSUs in India as on the date of submission of bids.
- 22.9 Other documents as required in the tender documents/NIT
23. Bids must be accompanied with:
  - 23.1 Scanned copy of all documents, certificates specified in Pre - qualification Criteria/technical bid.  
Scanned copy of all documents of similar work(s) as required.
  - 23.2 Scanned copy of duly signed information about work in hand.
  - 23.3 Scanned copy of duly signed details of T&P/equipment/machinery available.
  - 23.4 Scanned copy of duly signed declaration of contractor in prescribed format filled in agency's letter head attached with the tender.
  - 23.5 Scanned copy of duly signed undertaking for guarantee in prescribed format on agency's letter head attached with the tender.
  - 23.6 Scanned copy of duly signed undertaking for non - blacklisted status
  - 23.7 Scanned copy of duly signed declaration on financial statement with copy of the audited Statements for each of the last five financial years
  - 23.8 Scanned copy of minutes of Pre - bid meeting duly signed by Contractor.
  - 23.9 Scanned copy of the registration certificate in appropriate class for Individual contractor and registration certificates.
  - 23.10 Scanned copy of key personnel
  - 23.11 Scanned copies of other documents as required in NIT
  - 23.12 This tender is subject to issuance of NOC from MSRTC; ASCDCL reserved the right to cancel the tender at any stage of bidding process without assigning any reason thereof.
  - 23.13 Testing Charges will be reimbursed as per Maharashtra PWD 20-21 SSR
  - 23.14 Royalty Charges will be reimbursed at actual.

## 1. INSTRUCTIONS FOR BIDDERS

### 1.1 Introduction

- 1.1.1 Aurangabad Smart City Development Corporation Limited (“**the Corporation**” or “**ASCDCL**”), is a Special Purpose Vehicle (SPV) established as a public limited company under the Indian Companies Act, 2013 for the implementation of the Smart City project in Aurangabad. Aurangabad Municipal Corporation (**AMC**) has equity shareholding in ASCDCL. AMC and Government of Maharashtra (**GoM**) have majority shareholding and control of ASCDCL.
- 1.1.2 ASCDCL intends to build: Construction of Smart City Bus Depot at Mukundwadi, Aurangabad for which RFP is floated to those eligible contractors who can do the construction as per RFP document. The Bidders can submit their bids on percentage rate contract basis. The details are provided in the document.
- 1.1.3 Bid submissions must be made not later than the Bid Due Date specified in the “Schedule of Bidding Process” (Clause 2.1.7) in the manner specified in the RFP document and at the address as mentioned therein.
- 1.1.4 The selection will be based on two bid process as described in this RFP. The Technical Bids would be evaluated based on the qualification criteria set forth in the RFP. Financial Bids of only those applicants/ bidders whose Technical Bids qualify, shall be opened and evaluated.
- 1.1.5 ASCDCL reserves the right to cancel, terminate, change or modify this procurement process and /or requirements of Bid stated in the RFP, without assigning any reason or providing any notice and without accepting any liability for the same.

### 1.2 Tendering Procedure

- 1.2.1 Pre-bid or pre-tender conference/meeting (having same meaning) will be open to all prospective tenderers who have downloaded tender form before the date of Pre-tender Conference, will be held on 12/02/2021 at 11:00 Hrs. in the office of the ASCDCL, Aurangabad (Maharashtra) wherein prospective Tenderers will have an opportunity to obtain clarifications regarding the work and the Tender Conditions. The prospective tenderers are free to ask for any additional information or clarification either in writing or orally concerning the work, and the reply to the same will be given by the ASCDCL, Aurangabad (Maharashtra), in writing and the clarifications referred to as Common Set of Conditions/ Deviations (C.S.D.), shall form part of tender/bid documents and will be common and applicable to all tenderers. The point/points if any raised in writing and/or verbally by the contractor(s) in pre-tender conference and not finding place in C.S.D. issued after the pre- bid conference, is/are deemed rejected. In such case the provision in NIT shall prevail. No individual correspondence shall be made thereafter with the contractor(s) in this regard. The tender submitted by the tenderer shall be based on the clarifications/additional facilities offered (if any) by ASCDCL.

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- 1.2.2 All tenderers are cautioned that tenders containing any deviation from the contractual terms and conditions, specifications or other requirements and conditional tenders shall be treated as non-responsive. The tender shall be unconditional. Conditional tenders shall be summarily REJECTED. The tenderer should clearly mention in forwarding letter that his offer (in envelope No. 1 & 2) does not contain any conditions, deviations from terms and conditions stipulated in the tender.
- 1.2.3 Tenderers should go through detailed procedure for viewing/downloading and submission of tenders/bids online themselves at the website <https://mahatenders.gov.in> and follow the procedure mentioned therein for different requirements/functions well in time. ASCDCL takes no responsibility of any delay or contractor's inability to submit the tenders.
- 1.2.4 Shortlisting of Contractors for Financial Bidding Process :
- The Tendering Authority will first open the Technical Bid documents of all Contractors and after scrutinizing these documents will shortlist the Contractors who are eligible for Financial Bidding Process. The shortlisted Contractors will be intimated by email/speed post/registered post.
- a. Opening of the Financial Bids:
- The Contractors may remain present in the Office of the Tender Opening Authority at the time of opening of Price/Financial Bids. However, the results of the Price/Financial Bids of all Contractors shall be available on the e-Tendering Portal immediately after the completion of opening process.
- 1.2.5 Time Limit
- The work is to be completed within time limit as specified in the N.I.T. which shall be reckoned from the date of written order for commencing the work and shall be inclusive of monsoon period. Time allowed for the work is 12 (Eight) months.
- 1.2.6 Tender Rate
- No alteration in the form of tender and the schedule of tender and no additions in the scope of special stipulations will be permitted. Rates quoted for the tender shall be taken as applicable for all leads and lifts, unless otherwise mentioned in the item.
- 1.2.7 Tender Units
- The tenderers should particularly note the units mentioned in the Schedule "B" (Bill of Quantities) on which the rates are based. No change in the units shall be allowed.
- 1.2.8 Correction
- No corrections shall be made in the tender documents. Any corrections that are to be made by the tenderer in filling up details shall be made by crossing the incorrect portion and writing the correct portions above with the initials of tenderer.

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### 1.2.9 Tender Acceptance

Acceptance of tender will rest with the ASCDCL who reserves the right to reject any or all tenders without assigning any reason therefore. The tenderer whose tender is accepted will have to enter into a regular agreement within 15 days of being notified to do so. In case of failure on the part of Tenderer to sign the agreement within the stipulated time, the earnest money/bid security paid by him shall stand forfeited and the offer of the tenderer shall be considered as withdrawn by him.

### 1.2.10 Conditional Tender

The tenders who do not fulfill the condition of the notification and the general rules and directions for the guidance of contractor in the agreement form or are incomplete in any respect are likely to be rejected without assigning any reason therefore -

- a. The Tenderers shall be presumed to have carefully examined the drawings, conditions and specifications of the work and have fully acquainted themselves with all details of the site, the conditions of rock/soil, pattern, river, weather characteristics, labour conditions and in general with all the necessary information and data pertaining to the work, prior to tendering for the work.
- b. The data whatsoever supplied by the ASCDCL along with the tender documents are meant to serve only as guide for the tenderers while tendering and the Department accepts no responsibility whatsoever either for the accuracy of data or for their comprehensiveness.
- c. The quarries for extraction of metal, murum etc., if required will be found out by the tenderers and shall ensure that full quantity of materials required for execution of the work strictly as per specification are available in these source before quoting the rates. In case the materials are not available due to reasons whatsoever, the contractor will have to bring the materials from any other source with no extra cost to ASCDCL. The rates quoted, should therefore be for all leads and lifts from wherever the materials are brought at site of work and inclusive of royalty to be paid to the Revenue Department by the Contractor.

### 1.2.11 Power of Attorney

If the tenderers are a firm or company, they should in their forwarding letter mention the names of all the partners together with the name of the person who holds the power of Attorney, authorizing him to conduct all transactions on behalf of the body, along with the tender.

1.2.11.1 The tenderer may, in the forwarding letter, mention any points may wish to make clear, but the right is reserved to reject the same or the whole of the tender if the same becomes conditional tender thereby.

1.2.11.2 The contractor or the firms tendering for the work shall inform the ASCDCL/Department if they appoint their authorized Agent on the work.

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- 1.2.11.3 No foreign exchange will be released by the Department for the purchase of plants and machinery or any item for the work required by the Contractor.
- 1.2.11.4 Any dues arising out of contract shall be recovered from the contractor as arrears, if not paid amicably. Moreover, recovery of ASCDCL/Government dues from the Contractors will be affected from the payment due to the Contractor.
- 1.2.11.5 All pages of tender documents, conditions, specifications, correction slips etc. shall be initialled by the tenderer. The tender should bear full signature of the tenderer, or his authorized power of Attorney holder in case of a firm.
- 1.2.11.6 The Income Tax at 2.0 % and surcharge or percentage in force from time to time or at the rate as intimated by the competent Income Tax authority shall be deducted from bill amount whether measured bill, advance payment or secured advance.
- 1.2.11.7 The successful tenderer will be required to produce, to the satisfaction of the specified concerned authority a valid concurrent license issued in his favour under the provisions of the Contract Labour (Regulation and Abolition) Act 1970 for starting the work. On failure to do so, the acceptance of the tender shall be liable to be withdrawn and also liable for forfeiture of the earnest money/bid security.
- 1.2.11.8 The tenderer shall submit the list of apprentices engaged by the Contractor under Apprentice Act.
- 1.2.11.9 Cess @ 1% (One percent) shall be deducted at source from every bill of the Contractor Under “Building and Other Construction for workers Welfare Cess Act 1996”.
- 1.2.11.10 Registration under GST Act 2017 is mandatory. TDS under rules 51 of GST Act 2017 and amendments thereof.
- 1.2.11.11 The rates quoted by the Contractor shall be deemed to be inclusive of the labour welfare cess and other taxes (other than GST) that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.
- 1.2.11.12 Contractor shall submit a certificate to the effect that “All the payments to the labour/staff are made in bank accounts of staff linked to Unique Identification Number (AADHAR CARD).” The certificate shall be submitted by the contractor within 30 days from the commencement of contract. If the time period of contract is less than 60 days, then such certificates shall be submitted within 15 days from the date of commencement of contract.
- 1.2.11.13 All the Clarifications, Circulars, Notifications and Resolutions related to tenders issued by Government of Maharashtra and which are uploaded on website of

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Maharashtra up to 15 days prior to date of submission of bid, shall have overriding effect on the conditions in bid document

- 1.2.11.14 If offers of two or more bidders are found identical, then all such bidders shall be asked to submit their revised offers in closed envelope in presence of tender opening authority, the offers shall be less than the offer already submitted. The bidders with lowest offer shall be considered for award of work.
- 1.2.11.15 Key Personnel - The absence of Key Personnel mentioned in the tender at site due to some genuine reason, personnel mentioned therein shall seek the prior written permission from the Engineer in charge of the Project/work.
- 1.2.11.16 For any Change in Personnel, contractor shall obtain prior written approval from Engineer in charge to replace the personnel with Personnel equal or more qualifications.
- 1.2.11.17 If contractor fails to appoint any of the staff mentioned in Annexure 4 at site, amount shown therein shall be recoverable from the contractor bill.
- 1.2.11.18 At any point of time during tender process, work execution period, Defect Liability Period, submitted papers/documents/applications including material purchase vouchers, test reports, bitumen challans, quantity related papers or any papers of contractor should be true, correct & if the papers submitted by Contractor is found incorrect, faulty, not true, dubious, bogus, forged etc. then relevant actions of blacklisting & criminal proceedings as per Indian Penal Code (IPC) shall be initiated against Contractor/ Partnership Firms/Private Ltd./Companies(Bidder). ASCDCL Officers / Engineers / Account Officers shall not be held responsible for the papers submitted by the Contractor.
- 1.2.11.19 During Technical bid scrutiny of envelop No.1 of tender, if contractor submits false papers / reports for fulfilment of qualifying criteria, then envelop No.2 of such contractor shall not be opened. Also such registered contractor / non registered contractor shall be blacklisted & information of contractor being blacklisted shall be circulated to all P. W. Divisions & allied P. W. Departments.
- 1.2.11.20 After issuance of work order, if it is found that papers submitted / uploaded are forged, bogus, incorrect, then such contractor shall be blacklisted & Criminal Proceeding as per IPC shall be initiated. If work is at initial stage, the tender of work shall be cancelled.

## **2. INSTRUCTIONS**

### **2.1 Brief Description of Bidding Process**



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- 2.1.1 The Bidders (Tenderers) shall submit their Bids in accordance with this RFP. The Bidders need to offer bids which conform to the tender documents/conditions provided as part of this RFP Document and the Technical Specifications. The Bid submitted by each Bidder will comprise of two envelopes:
- Envelope 1: “**Key Submissions and Technical Bid**”, which will further have two envelopes - (i) Envelope 1A with “**Key Submissions**”, and (ii) Envelope 1B with “**Technical Bid**”; and
  - Envelope 2: “**Price Bid**” (also referred as Financial Bid) has to be submitted online via <https://mahatenders.gov.in>
- 2.1.2 Bidders must note that the Price Bid of only such Bidders who submit responsive bids and meet the Qualification Criteria and are determined to be “Eligible Bidders” in accordance with the provisions of this RFP will be opened.
- 2.1.3 This RFP is not transferable.
- 2.1.4 Bidders are invited to examine the work details, and to carry out, at their cost, such studies as may be required for submitting their respective Bids.
- 2.1.5 The envelopes/communication shall clearly bear the following identification/title: CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD
- 2.1.6 Cost of RFP Document: The fee for purchase of this RFP document as specified in the Notice Inviting Tender, is payable online via <https://mahatenders.gov.in> . The tender fee shall be non-refundable. Without the payment of tender fee, the bids will be taken as incomplete and non-responsive and shall not be considered.
- 2.1.7 **Schedule of Bidding Process:** The ASCDCL shall endeavour to adhere to the following schedule.

**Table 1: Key dates of the events**

S. No.	Event Description	Date
1	Date of Issue of RFP	As per NIT
2	Last Date of Receiving Queries	As per NIT
3	Pre-Bid Meeting	As per NIT

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

4	Last Date for submission of pre bid queries	3 days before due date of Pre-bid meeting
5	Bid Due Date/Last date of submission	As per NIT
6	Opening of Envelope 1	As per NIT
7	Opening of Envelope 2	After declaration of eligible technical bids (date will be separately intimated)
8	Letter of Award (LOA)	After acceptance of the lowest bid
9	Signing of Contract	Within 15 days of issue of letter of award

- 2.1.8 **Bid due date and Bid Validity Period:** The last date of submission of the Bids (“the **Bid Due Date**”) shall be as specified in Table given in Clause 2.1.7 above. The Bids shall be valid for a period of **180 (one hundred and Eighty)** days from the Bid Due Date of submission (“**Bid Validity Period**”).
- 2.1.9 Bids should be submitted before 16:00 Hrs of 22/02/2021 (Bid Due Date) at the address and in the manner and form as detailed in this RFP.
- 2.1.10 The ASCDCL may, in its sole discretion, extend the Bid Due Date by issuing an Addendum uniformly for all Bidders.
- 2.1.11 Bids received by the ASCDCL after the specified time on the Bid Due Date shall not be eligible for consideration and shall be summarily rejected.
- 2.1.12 The hard copy of the Technical Bid is required to be submitted at the address and in the manner and form as detailed in this RFP. However, hard copies of the Price Bid is not required. The Price Bid must be submitted via <https://mahatenders.gov.in> only.
- 2.1.13 The complete Bidding Documents include the details of the Project which is being provided and the Schedules including details of Bill of Quantities. The aforesaid documents and any addenda issued subsequent to this RFP Document, will be deemed to form part of the Bidding Documents.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- 2.1.14 Bidders are advised to examine the work in detail, and to carry out, at their cost, such studies as may be required for submitting their respective Bids for submission of bida/award of the contract and carrying out the work including site details.
- 2.1.15 The documents including this RFP and all attached documents, provided by the ASCDCL are and shall remain or become the property of the ASCDCL and are transmitted to the Bidders solely for the purpose of preparation and the submission of a Bid in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Bid. The provisions of this Clause shall also apply mutatis mutandis to Bids and all other documents submitted by the Bidders, and the ASCDCL will not return to the Bidders any Bid, document or any information provided along therewith.
- 2.1.16 Any award of the work pursuant to this RFP shall be subject to the terms of Bidding Documents.
- 2.1.17 Any agency/contractor/entity which has been barred by the Central/State Government, or any entity controlled by it, from participating in any project/work, and the bar subsists as on the date of the Bid, would not be eligible to submit a Bid.
- 2.1.18 A Bidder should, in the last 3 (three) years, have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Bidder, or Associate, as the case may be, nor has been expelled from any project or contract by any public entity nor have had any contract terminated any public entity for breach by such Bidder.
- 2.1.19 Notwithstanding anything to the contrary contained in this RFP, the detailed terms specified in this document shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Agreement.

### **2.2 Compliant Bids/Completeness of Response**

- 2.2.1 Bidders are advised to study all instructions, forms, terms, requirements and other information in the RFP documents carefully. Submission of the bid shall be deemed to have been done after careful study and examination of the RFP document with full understanding of its implications.
- 2.2.2 Failure to comply with the requirements of this paragraph may render the bid non-compliant and the Bid may be rejected. Bidders must:
- i. Include all documentation specified in this RFP, in the bid
  - ii. Follow the format of this RFP while developing the bid and respond to each element in the order as set out in this RFP.
  - iii. Comply with all requirements as set out within this RFP.

### **2.3 Bidder to Inform**

The Bidder shall be deemed to have carefully examined the Terms & Conditions, Scope, Service Levels, Specifications, conditions, contract clauses and Schedules of this RFP. If bidder has any doubts/clarifications as to the meaning of any portion of the conditions or the specifications he shall, before the last date for submission of Pre-Bid Queries, set forth thereof and submit them to ASCDCL in writing in order that such doubt may be removed or clarifications are provided.

### **2.4 Bid Preparation costs**

The Bidder shall bear all costs associated with the preparation and submission of its bid, and for the purposes of clarification of the bid, if so desired by ASCDCL.

### **2.5 Pre-bid meeting & Clarification**

- a. Any clarification regarding the RFP document and any other item related to this project can be submitted to ASCDCL as per the submission mode and timelines mentioned in the Schedule of Bidding Process.
- b. The pre-bid queries should be submitted, along with relevant justification, and with name and details of the organisation submitting the queries.
- c. ASCDCL shall not be responsible for ensuring that the bidders' queries have been received by them. Any requests for clarifications post the indicated date and time shall not be entertained by ASCDCL.
- d. Bidders must submit their queries as per the format mentioned in **Appendix – 1**.

#### **2.5.1 Responses to Pre-Bid Queries and Issue of Corrigendum**

- i. ASCDCL will organize a pre-bid meeting and will respond to any request for clarification or modification of the bidding documents. ASCDCL shall formally respond to the pre-bid queries after the pre-bid meeting. No further clarifications shall be entertained after the date and time of submission of queries.
- ii. ASCDCL shall endeavour to provide timely response to all queries. However, ASCDCL makes no representation or warranty as to the completeness or accuracy of any response made in good faith. ASCDCL does not undertake to answer all the queries that have been posed by the bidders.
- iii. Any modifications of the RFP Documents, which may become necessary because of the Pre-Bid Meeting, shall be made by ASCDCL exclusively through a corrigendum/addendum. Any such corrigendum shall be deemed to be incorporated into this RFP. However, in case of any such amendment, the bid submission date may be extended at the discretion of ASCDCL.
- iv. Any corrigendum/notification issued by ASCDCL, after issue of RFP, shall only be available/hosted on the website URL mentioned in the Schedule of Bidding Process. Any such corrigendum shall be deemed to be incorporated into this RFP.

**2.6 Earnest Money Deposit (EMD)/Bid Security**

- 2.6.1 The Bidders are required to deposit, along with the Bid, an Earnest Money Deposit (EMD)/Bid security of Rs.11,30,000/- (Eleven Lakhs Thirty Thousand Only) (“Earnest Money Deposit”, which shall be paid online via <https://mahatenders.gov.in> using payment Gate way mode. EMD/Bid security shall be drawn directly from the account of Bidder / Bidding Firm.

**Earnest Money/Bid Security in the form of cheques or any other form except above will not be accepted.**

After Tender opening, the EMD/Bid security of the unsuccessful bidder will be returned to account provided by the bidder during the bid preparation as given in challan under Beneficiary Account Number. The amount will be refunded to the unsuccessful tenderers on deciding about the acceptance or otherwise of the tender. In case of successful tenderer, the said amount of earnest money/bid security shall be adjusted towards the amount of security deposit payable by him under conditions of General Conditions of Contract after signing of the agreement.

- 2.6.2 Proof of EMD/Bid security payment must be scanned and uploaded online along with the Technical Bid documents as a part of “key Submissions” in Envelope 1 A.
- 2.6.3 Any Bid not accompanied by the EMD/Bid security shall be summarily rejected by the ASCDCL as non- responsive.
- 2.6.4 The EMD/bid security of unsuccessful Bidders will be returned by the ASCDCL, without any interest, as promptly as possible and latest by 30th day of signing of the Contract by the Successful Bidder or when the ASCDCL cancels the Bidding Process.
- 2.6.5 The Successful Bidder’s EMD/Bid security will not be returned and shall be retained as security for the Successful Bidder to execute the Contract.
- 2.6.6 The ASCDCL shall be entitled to forfeit and appropriate the EMD/Bid security inter alia in any of the events specified in Clause 2.6.8 herein below. The Bidder, by submitting its Bid pursuant to this RFP, shall be deemed to have acknowledged and confirmed that the ASCDCL will suffer loss and damage on account of withdrawal of its Bid or for any other default by the Bidder during the Bid Validity Period as specified in this RFP. No relaxation of any kind on EMD/Bid security shall be given to any Bidder.
- 2.6.7 The EMD/Bid security shall be furnished in Indian Rupees only. No interest shall be payable by the ASCDCL on the EMD/Bid security.
- 2.6.8 The EMD/Bid Security shall be forfeited and appropriated by the ASCDCL without prejudice to any other right or remedy that may be available to the ASCDCL hereunder or otherwise;

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2.6.8.1 If a Bidder engages in a corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice as specified in Clause 2.19 of this RFP;

2.6.8.2 If after submitting the tender, the tenderer/contractor withdraws his offer or modifies the same, or if after the acceptance of his Tender, the contractor fails or neglects to furnish the security deposit; without prejudice to any other right and powers of ASCDCL hereunder, or in law, ASCDCL shall be entitled to forfeit the full amount of the earnest money/bid security deposited by him.

2.6.8.3 In the case of Successful Bidder, if it fails within the specified time limit:

- i. To sign and return the duplicate copy of LOA in accordance with the terms thereof;
- ii. To sign the Contract within the time specified by the ASCDCL;
- iii. To furnish the Security Deposit within the period prescribed in the Contract; or
- iv. In case the Successful Bidder, having signed the Contract, commits any breach thereof prior to furnishing the Security Deposit.

### 2.7 Contents of Bid

**The bidder must purchase the bidding documents via online mode by depositing the cost of Tender.**

The first envelope “Envelope No.1” shall contain the following documents.

- i. The EMD/Bid security will be paid via online mode only. It should be ensured that the online EMD/Bid security paid through bidders account only in the form of online payment Gate way mode. EMD/Bid security shall be drawn directly from the account of Bidder / Bidding Firm. Scanned copies of proof of tender fee payment and EMD/Bid security payment.
- ii. Scanned copy from original copy of covering letter regarding details of contractor and completeness, correctness and truthfulness of documents submitted on plain paper as per prescribed proforma given in **Annexure 1**.
- v. Scanned copy from original copies of Bidder’s Similar work Experience as per **Annexure 2**.
- vi. Scanned copy from original copy of affidavit regarding completeness, correctness and truthfulness of documents submitted on Stamp paper Rs 500/- as per prescribed proforma given in **Annexure 3**.
- vii. Scanned copy from original copies of CVs of key personnel as per **Annexure 4/4A** duly signed by the contractor.
- viii. Scanned copy from original copy of Power of Attorney on behalf of firm, proprietorship firm/Partnership firm / Pvt limited Company or any other registered company Registered with Registrar of Company to sign agreement/ other correspondence with department authority (**Annexure 5**).

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- ix. Scanned copy from Financial Statement along with Audited Annual accounts for last three years as per **Annexure 6**.
- x. Scanned copy from original list of Tools & Plants/Machinery duly signed by the contractor as per **Annexure 7**.
- xi. Scanned copy from Declaration of non-blacklisting as per **Annexure 8**.
- xii. Scanned copy from No deviation certificate as per **Annexure 9**.
- xiii. Scanned copy from original of Notarised agreement Joint Venture, if Applicable. In present bid, joint ventures are not allowed.
- xiv. Scanned copy from original of Registration documents of firm( Firm, Proprietorship firm/ Partnership firm /Registration of Private limited company / Registration of Public limited company or any other company or any other Company as the case may be.
- xv. Scanned copy from original list of works completed and in hand and works tendered along with supporting certificates in **Annexure 10**.
- ~~xvi. A self attested affidavit that “Additional Performance Security is enclosed in Envelop No. 2” shall be included in the Technical Bid Envelope No. 1. Such Performance security of required amount, if not found in Envelope No. 2 (in case tendered rates are found below 1% of amount put to tender), the offer shall be treated as invalid and rejected forthwith.~~

2.7.1 The bidder shall submit its Bid in two envelopes as follows:

**Table 2: Brief Details of Procedure for submission of Bid**

S. No.	Envelope and Title	Annexures to be inserted	Documents to be attached
1	Envelope 1: “Key Submissions and Technical Bid”		
	Envelope 1A: Key Submissions		Copy of Proof of RFP Fee Payment and copy of proof of EMD/Bid security payment
	Envelope 1B: “Technical Bid”	Annexure 1, 2, 3, 4,4A, 5, 6, 7,8, 9, Ors	<ul style="list-style-type: none"> <li>• RFP document, Contract conditions and Corrigendum /Addendum, if any, signed &amp; sealed by the authorized representative</li> <li>• Cover letter as per Annexure 1: Bid Covering Letter</li> </ul>

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		<ul style="list-style-type: none"> <li>• Bidder’s Similar work Experience as per Annexure 2 along with the necessary documents as per RFP</li> <li>• Details of the Bidder as per Annexure 3</li> <li>• Details of Key Personnel as per Annexure 4 &amp; 4A</li> <li>• Power of Attorney as per Annexure 5</li> <li>• Financial Statement as per Annexure 6 along with Audited Annual accounts.</li> <li>•Details of T&amp;P/Machinery as per Annexure 7</li> <li>• Declaration of Non-blacklisting as per Annexure 8</li> <li>• No deviation certificate as per Annexure 9</li> <li><del>Self attested Affidavit of submission of Additional Performance Security in Envelope no. 2 (in case tendered rates are found below 1% of amount put to tender);</del></li> <li>• Any other documents required as per the RFP terms.</li> </ul> <p>The Price Bid / prices should not be mentioned anywhere in Envelope-1.</p>
2	Envelope 2: Price Bid	<p>To be submitted online via e-tendering portal only. <del>Additional Performance security (in case tendered rates are found below 1% of amount put to tender);</del></p>

**2.7.2 Sealing and Marking of Bids**

- i. Envelope 1 shall contain two sealed envelopes, namely Envelope 1A and Envelope 1B. The sealed Envelope 1A and sealed Envelope 1B shall then be placed in a single outer envelope marked as Envelope 1.
- ii. The Bidders shall seal Envelope 1 and Envelope 2 separately in two envelopes, duly marking the envelopes as “Envelope 1: KEY SUBMISSIONS AND TECHNICAL BID” and “Envelope 2: PRICE BID”; respectively. Envelope 2 shall be submitted only via <https://mahatenders.gov.in> .



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- iii. Bidders shall provide one duplicate of Envelope 1. The Bidder shall seal the original and duplicate of the “Key Submissions” and “Technical Bid” in separate envelopes, duly marking the envelopes as “ORIGINAL” and “DUPLICATE”. The envelopes shall then be sealed in a single larger outer envelope. In the event of any discrepancy between the original and duplicate, the original shall prevail.
- iv. Each of the envelopes shall be addressed to:

ASCDCL, War Room, Ambedkar Research Center, Near Amkhas  
Maidan, Aurangabad- 431001. Email: [hq@aurangabadsmartcity.in](mailto:hq@aurangabadsmartcity.in)
- v. If the envelopes are not sealed and marked as instructed above, the ASCDCL assumes no responsibility for the misplacement or premature opening of the contents of the Bid submitted and consequent losses, if any, suffered by the Bidder.
- vi. The name of work for which the Bid is submitted should be clearly indicated on the cover of the envelopes.
- vii. Bids submitted by fax, telex, telegram or e-mail shall not be entertained and shall be rejected.

### **2.8 Language**

The bids should be prepared and submitted by the bidders in English language only. If any submitted supporting documents are in any language other than English, translation of the same in English language is to be provided (duly attested) by the Bidders. For purposes of interpretation of the documents, the English translation shall govern.

### **2.9 Authentication of Bids**

Bid should be accompanied by an authorization in the name of the signatory (or signatories) of the Bid. The authorization shall be in the form of a written power of attorney accompanying the Bid or in any other form demonstrating that the representative has been duly authorized to sign.

### **2.10 Pre-Bid Meeting**

2.10.1 Pre-bid meeting of the Bidders shall be convened on 12/02/2021 at 11:00 Hrs. at the following venue;

ASCDCL, War Room, Ambedkar Research Center, Near Amkhas  
Maidan, Aurangabad- 431001. Email: [hq@aurangabadsmartcity.in](mailto:hq@aurangabadsmartcity.in)

2.10.2 Bidders shall bear their own cost of attending any pre-bid meeting.

2.10.3 During the course of pre-bid meeting(s), the Bidders will be free to seek clarifications and make suggestions for consideration of the ASCDCL. The ASCDCL 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.

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- 2.10.4 Details of proposed/ suggested variations/ deviations/ additions from the Proposal specifications/ conditions, if any, should be clearly indicated while sending queries before Pre-Proposal Bid Meeting. No further suggestions for deviations/ variations/ additions shall be entertained after the Pre- Bid Meeting.
- 2.10.5 The ASCDCL may clarify on variations/ deviations, alternative proposals, which ensure equal or higher quality/ performance to the Technical Specifications during Pre- Bid Meeting. However, the decision of the ASCDCL in this regard shall be final.
- 2.10.6 After incorporating amendments acceptable to Authority, RFP Document shall be frozen through issuance of an Addendum(s). Addendum to RFP Document shall be uploaded on <https://mahatenders.gov.in>
- 2.10.7 Non-attendance at the pre-bid meeting shall not be a cause for disqualification of a Bidder. However, terms and conditions of the Addendum(s) shall be legally binding on all the Bidders irrespective of their attendance at the Pre-Bid Meeting.

### **2.11 Amendment of Request for Proposal**

- a. At any time prior to the due date for submission of bid, ASCDCL may, for any reason, whether at its own initiative or in response to a clarification requested by prospective bidder(s), modify the RFP document by amendments. Such amendments shall be uploaded on the e-procurement portal website, through corrigendum and shall form an integral part of RFP document. The relevant clauses of the RFP document shall be treated as amended accordingly.
- b. It shall be the responsibility of the prospective bidder(s) to check the website from time to time for any amendment in the RFP document. In case of failure to get the amendments, if any, ASCDCL shall not be responsible.
- c. In order to allow prospective bidders a reasonable time to take the amendment into account in preparing their bids, ASCDCL, at its discretion, may extend the deadline for submission of bids. Such extensions shall be uploaded on the website of ASCDCL.

### **2.12 Deviations and Exclusions**

Bids shall be submitted strictly in accordance with the requirements and terms & conditions of the RFP. The Bidder shall submit a No Deviation Certificate as per the format mentioned in **Annexure 9**. The bids with deviation(s) are liable for rejection.

### **2.13 Late Bids**

- a. Late submission will not be entertained and will not be permitted by e-Procurement Portal.
- b. The bids submitted by telex/telegram/fax/e-mail etc. shall not be considered. No correspondence will be entertained on this matter.
- c. ASCDCL shall not be responsible for any non-receipt/non-delivery of the documents due to technical snag whatsoever at Bidder's end. No further correspondence on the subject will be entertained.
- d. ASCDCL reserves the right to modify and amend any of the above-stipulated condition/criterion.

**2.14 Right to Terminate the Process**

ASCDCL may terminate the RFP process at any time and without assigning any reason. ASCDCL makes no commitments, express or implied, that this process will result in a business transaction with anyone. This RFP does not constitute an offer by ASCDCL.

**2.15 Non-Conforming bids**

A bid may be construed as a non-conforming bids and ineligible for consideration:

- a. If it does not comply with the requirements of this RFP.
- b. If a bid does not follow the format requested in this RFP or does not appear to address the requirements of the solution.

**2.16 Acceptance/Rejection of Bids**

- a. ASCDCL reserves the right to reject in full or part, any or all bids without assigning any reason thereof. ASCDCL reserves the right to assess the Bidder's capabilities and capacity. The decision of ASCDCL shall be final and binding.
- b. Bid should be free from overwriting. All erasures, correction, or addition must be clearly written both in words and figures and attested.
- c. In the event of any assumptions, presumptions, key points of discussion, recommendation or any points of similar nature submitted along with the Bid, ASCDCL reserves the right to reject the Bid and forfeit the EMD/Bid security.

**2.17 Confidentiality**

Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising the ASCDCL/Authority in relation to, or matters arising out of, or concerning the Bidding Process. The ASCDCL/Authority will treat all information, submitted as part of the Bid, in confidence and will require all those who have access to such material to treat the same in confidence. The ASCDCL/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 ASCDCL/Authority or as may be required by law or in connection with any legal process.

**2.18 Disqualification**

The bid is liable to be disqualified in the following cases or in case bidder fails to meet the bidding requirements as indicated in this RFP:

- a. During validity of the bid, or its extended period, if any, the bidder changes its quoted prices
- b. Bidder's bid is conditional and has deviations from the terms and conditions of RFP
- c. Bid is received in incomplete form
- d. Bid is not accompanied by all the requisite documents

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- e. Information submitted in technical bid is found to be misrepresented, incorrect or false, accidentally, unwittingly or otherwise, at any time during the processing of the contract (no matter at what stage) or during the tenure of the contract including the extension period if any
- f. Financial bid is enclosed with the same document as technical bid or not submitted online.
- g. Bidder tries to influence the bid evaluation process by unlawful/corrupt/fraudulent means at any point of time during the bid process
- h. In case the bidder submits multiple bids or if common interests are found in two or more bidders, the bidders are likely to be disqualified, unless additional bids/bidders are withdrawn upon notice immediately.

### **2.19 Fraud and Corrupt Practice**

- a. The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Selection Process. Notwithstanding anything to the contrary contained in this RFP, ASCDCL shall reject a Bid without being liable in any manner whatsoever to the Bidder, if it determines that the Bidder has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice (collectively the “Prohibited Practices”) in the Selection Process. In such an event, ASCDCL shall, without prejudice to its any other rights or remedies, forfeit and appropriate the EMD/Bid security and/or Security deposit and/or Performance security, as the case may be, as mutually agreed genuine pre-estimated compensation and damages payable to ASCDCL for, inter alia, time, cost and effort of ASCDCL, in regard to the RFP, including consideration and evaluation of such Bidder’s Bid.
- b. Without prejudice to the rights of ASCDCL under Clause above and the rights and remedies which ASCDCL may have under the Letter of Award or the Agreement, if a Bidder is found by ASCDCL 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 Selection Process, or after the issue of the Letter of Award or the execution of the Agreement, such Bidder shall not be eligible to participate in any tender or RFP issued by ASCDCL during a period of 3 years from the date such Bidder is found by ASCDCL to have directly or through an agent, engaged or indulged in any Prohibited Practices.
- c. For the purposes of this Clause, the following terms shall have the meaning hereinafter respectively assigned to them:
  - i. “corrupt practice” means (a) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of any person connected with the Selection Process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of ASCDCL who is or has been associated in any manner, directly or indirectly with the Selection Process or the Letter of Award (LOA) or has dealt with matters concerning the 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 ASCDCL, shall be deemed to constitute influencing the actions of a person connected with the Selection Process); or (b) save as provided herein, engaging in any manner whatsoever, whether during the Selection

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Process or after the issue of the LOA or after the execution of the Agreement, as the case may be, any person in respect of any matter relating to the Project or the Award or the Agreement, who at any time has been or is a legal, financial or technical consultant/adviser of ASCDCL in relation to any matter concerning the Project;

- ii. “fraudulent practice” means a misrepresentation or omission of facts or disclosure of incomplete facts, in order to influence the Selection Process;
- iii. “coercive practice” means impairing or harming or threatening to impair or harm, directly or indirectly, any persons or property to influence any person’s participation or action in the Selection Process;
- iv. “undesirable practice” means (a) establishing contact with any person connected with or employed or engaged by ASCDCL with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Selection Process; or (b) having a Conflict of Interest; and
- v. “restrictive practice” means forming a cartel or arriving at any understanding or arrangement among Bidders with the objective of restricting or manipulating a full and fair competition in the Selection Process.
- vi. Successful bidder will have to sign Integrity Pact as per Annexure 13.

### **2.20 Conflict of Interest**

- a. A bidder shall not have a conflict of interest that may affect the Selection Process or the solution delivery (the “Conflict of Interest”). Any Bidder found to have a Conflict of Interest shall be disqualified. In the event of disqualification, ASCDCL shall forfeit and appropriate the EMD/Bid security, if available, as mutually agreed genuine pre-estimated compensation and damages payable to ASCDCL for, inter alia, the time, cost and effort of ASCDCL including consideration of such Bidder’s Bid (“the Damages”), without prejudice to any other right or remedy that may be available to ASCDCL hereunder or otherwise.
- b. ASCDCL requires that the bidder provides solutions which at all times hold ASCDCL’s interest’s paramount, avoid conflicts with other assignments or its own interests, and act without any consideration for future work. The bidder shall not accept or engage in any assignment that would conflict with its prior or current obligations to other clients, or that may place it in a position of not being able to carry out the assignment in the best interests of ASCDCL.
- c. Without limiting the generality of the above, a Bidder shall be deemed to have a Conflict of Interest affecting the Bidding Process, if:
  - i. The Bidder, and any other Bidder, have common controlling shareholders or other ownership interest; provided that this disqualification shall not apply in cases where the direct or indirect shareholding of a Bidder, or an Associate thereof (or any shareholder thereof having a shareholding of more than 5% (five per cent) of the paid up and subscribed share capital of such Bidder, Member or Associate, as the case may be) in the other Bidder, or Associate, is less than 5% (five per cent) of the subscribed and paid up equity share capital thereof; provided further that this disqualification shall not apply to any ownership by a bank, insurance company, pension fund or a public financial institution referred to in sub-section (72) of section 2 of the Companies Act, 2013. For the purposes of this Clause, indirect shareholding held through one or more intermediate persons shall be computed as follows: (aa) where any intermediary is controlled

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by a person through management control or otherwise, the entire shareholding held by such controlled intermediary in any other person (the “Subject Person”) shall be taken into account for computing the shareholding of such controlling person in the Subject Person; and (bb) subject always to sub-clause (aa) above, where a person does not exercise control over an intermediary, which has shareholding in the Subject Person, the computation of indirect shareholding of such person in the Subject Person shall be undertaken on a proportionate basis; provided, however, that no such shareholding shall be reckoned under this sub-clause (bb) if the shareholding of such person in the intermediary is less than 26% of the subscribed and paid up equity shareholding of such intermediary; or

- ii. Such Bidder receives or has received any direct or indirect subsidy, grant, concessional loan or subordinated debt from any other Bidder, or has provided any such subsidy, grant, concessional loan or subordinated debt to any other Bidder; or
- iii. Such Bidder has the same legal representative for purposes of this Bid as any other Bidder; or
- iv. Such Bidder, has a relationship with another Bidder, 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 Bid of either or each other; or
- v. Such Bidder has participated as a consultant to the ASCDCL/Authority in the preparation of any documents, design or technical specifications of the Project.

### **2.21 Withdrawal, Substitution, and Modification of Bids**

- a. A Bidder may withdraw its Bid or re-submit its Bid (technical and/ or financial) as per the instructions/ procedure mentioned at e-Procurement website
- b. Bids withdrawn shall not be opened and processed further.

### **2.22 Site Visit**

- a. Before filling this application/submitting the bids, the Bidders shall visit the Site and satisfy themselves as to the conditions prevalent there especially regarding accessibility to the Site, nature and extent of the city, working conditions, stocking of materials, installation of tools and equipment etc., accommodation and movement of labour for satisfactory completion of the works, applicable laws and regulations, and any other matter considered relevant for them. To obtain first-hand information on the local conditions, the Bidders are encouraged to visit the proposed locations before submitting Bids. No financial claims for such visits and for collection of information shall be reimbursable. The Bidders must carry proper due diligence of the applicable local taxes/charges etc., which may affect their project financials.
- b. It shall be deemed that by submitting a Bid, the Bidder has:
  - i. made a complete and careful examination of the bidding documents;
  - ii. received all relevant information requested from the ASCDCL/authority(ies);
  - iii. accepted the risk of inadequacy, error or mistake in the information provided in the bidding documents or furnished by or on behalf of the Authority relating to any of the matters referred to various clauses;

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- iv. satisfied itself about all matters, things and information including matters referred to various clauses herein above necessary and required for submitting an informed bid, execution of the project in accordance with the bidding documents and performance of all of its obligations there under;
  - v. acknowledged and agreed that inadequacy, lack of completeness or incorrectness of information provided in the bidding documents or ignorance of any of the matters referred to in various clauses herein shall not be a basis for any claim for compensation, damages, extension of time for performance of its obligations, loss of profits etc. from the ASCDCL;
  - vi. acknowledged that it does not have a conflict of interest; and
  - vii. agreed to be bound by the undertakings provided by it under and in terms hereof.
- c. The ASCDCL 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 RFP, the Bidding Documents or the Bidding Process, including any error or mistake therein or in any information or data given by the ASCDCL.

### FOR SPECIAL ATTENTION OF TENDERER

The tenderers are expected to visit the site before quoting the tender and get themselves fully acquainted with the site conditions and site requirements.

The tenderers shall study the site and general conditions in respect of approaches, labour, water supply, climate, quarries and the data included in the tender document and get verified from the actual inspection of site, etc., before submitting the tender. In case of any doubt about any item or data included in the tender or otherwise, it shall be got clarified by applying in writing to the tender inviting authority at least 3 days before the date of pre-bid meeting. Once the tender is submitted, it shall be concluded that the contractor is well versed and agrees to all the details required for completing the work as per tender conditions and specifications.

- The bidders are required to examine the enclosed general plan and tender form and conditions mentioned in the tender.
- No additional clauses, alterations in specifications by the bidder will be accepted. If done the bidder is disqualified.
- The successful bidder shall execute an agreement with the ASCDCL, a specimen of which is given in this tender document. EMD is refunded to the bidders after the issue of the work order to the contractor qualified for the work.
- Final bill will be settled after receiving a completion certificate of actual completion of work by the ASCDCL.
- The work is to be completed and commissioned within 12 MONTHS from the date of signing the agreement with the ASCDCL.
- The successful bidder or his personnel must give personal attention to the work and rectification of the defects until the —defects liability period which is 3 years.
- Quarterly joint inspection must be done by tenders if any defects found must be rectified within 1 week must be done as per ASCDCL instructions.
- The ASCDCL reserves the right to reject any portion of work or materials which is found unsatisfactory /not up to the standard.
- ASCDCL reserve right to increase or decrease quantity by 25 % of total estimated cost of work.

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- The successful bidder shall have to pay liquidity damages of 0.5 % of the total value per week as penalty for delay of work up to a maximum of 10% of the total value of work.

### Note:

- a. All supplied and fixed material must comply or exceed relevant IS Code standards.
- b. Post issuance of work order detailed technical data sheet of product must submitted by contractor for the approval of ADCDCL.
- c. Contactor should take all the approval for material & drawings from ASCDCL.

### 2.23 Qualification Criteria

#### 2.23.1 Qualification Criteria

The tenderer/bidder must have-

1. achieved a minimum average annual financial turnover of **Rs 844.12 Lakhs ( Rupees Eight Hundred Fourty four Lakhs & Twelve Thousand only)** during last five financial years ending 31<sup>st</sup> March 2020 (2015-16 to 2019-20) updated to current cost (For civil engineering works only ). For updating to current cost please refer Table 3.

2. experience in successfully completed **Three (3)** Similar works, each work value not less than **Rs. 450.20 Lakhs (Rupees Four Hundred Fifty Lakhs & Twenty Thousand Only)** updated to current cost, during the last five years (2015-16 to 2019-20).

Or

experience in successfully completed **Two (2)** Similar work each work value not less than **Rs. 562.75 Lakh (Rupees Five Hundred Sixty Two Lakhs & Seventy Five Thousand Only )** updated to current cost, during the last five years (2015-16 to 2019-20).

Or

experience in successfully completed **One (1)** Similar work of value not less than **Rs. 900.39 lakhs (Rupees Nine Hundred Lakhs & Thity Nine Thousand only)** updated to current cost during the last five years (2015-16 to 2019-20).

**SIMILAR WORK** means building work involving RCC work, TMT steel reinforcement, brick work, plastering, flooring, and colouring, & have successfully completed work with minimum quantities mentioned in table 4 under single civil engineering work.

Note: Above work should have been completed in combination. Only RCC work or brick work will not be considered as similar work.

For the purpose, —Cost of work shall mean gross value of works associated with civil engineering works.



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**Table 3: Updating weightage to Current Cost**

Sr. No.	Year	Cost of work	Updated cost %
1.	2019-20	100	100
2.	2018-19	100	110
3.	2017-18	100	121
4.	2016-17	100	133
5.	2015-16	100	146

Similar work means the work in which minimum quantities of items have been executed as given in Table 4

. Certificates are required to be obtained from the officer not below the rank of Executive Engineer or Equivalent for works carried out in Govt/ Semi Govt Bodies or equivalent competent authority in case of local bodies. In case of other than Govt./ Semi Govt. /PSUs / Autonomous Bodies etc., certificates are required to be obtained from Director / CEO / or Office in Charge of Project or equivalent.

**Table 4: Similar work Details**

S. No.	Item of work	Quantity	Unit
1	M20-RCC Concrete	452.70	CUM
2	TMT Bar Reinforcement	47.31	MT
3	AAC Block	154.14	CUM

**Note:** Where more than one similar work as defined in the RFP is furnished by the bidder in support of the experience criteria, compliance with the quantities mentioned in table 4 in at least one successfully completed civil engineering contract shall suffice.

**The Criteria mentioned is for works carried out in Govt /Semi Govt Bodies. For other than Govt/Semi Govt works the criteria of cost of works and quantities above shall be two times of the mentioned above in Table 4 and they will have to submit the documents supporting the claims of the cost of works against which TDS has been deducted.**

### 2.23.2 Bid Capacity

The bid capacity shall not be less than the estimated cost put to tender for which the bid is submitted. Bid capacity will be evaluated as part of post qualification in the following manner;

$$\text{Bid Capacity} = 2 \times (A \times N) - B$$

A = Maximum annual turnover of civil engineering works excluding private works during last five years (updated to the current level as per Table 3) which will take into account the completed and part of ongoing works completed during last five years (Such certificates are required to be obtained from the chartered accountant Maharashtra state only). Last five years mean 2015-16 to 2019-20.

N = Number of years in which present work is stipulated to be completed. If the time stipulated is between 0.5 and 1 year, N value shall be considered as 1 (hence In the present case N=1).

B = Total ongoing commitments (ongoing works and existing commitments) value (updated to the price level of the year indicated in the Table 3) of existing commitments and on-going works to be completed during the next **12/12 Years (12 Months)** (period of completion of the works for which bids are invited)

#### Note:

- The statements 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 countersigned by the Engineer in charge, not below the rank of an Executive Engineer or equivalent. Please provide details as per Annexure 10.
- **The Price Bid shall be opened only if the bid capacity calculated is not less than the estimated cost of work put to tender.**
- The updating of current cost of works executed earlier to above mentioned period shall be worked out in the same manner shown in Table 3.
- The contractor will submit his own calculation of Bid Capacity in Annexure 10 A but the same is subjected to scrutiny and check. If the same is found to be incorrect and not based on required certificates, the calculation made by ASCDCL shall be final.

### 2.23.3 T&P/ Equipment

- a. The tenderer shall own/leased the following key equipment (Table 5) in the full working conditions. The bidder shall submit scanned copy of proof of (either owned or leased) following equipment.

#### **Table 5: T&P/Equipment**

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S. No.	Type of Equipment	Maximum age as on 01.4.2020 (Years)	Number of equipment required
N1.	Water Tanker	10 years	1
2.	Concrete Mixer Machine	10 years	1
3.	Tile Cutter	10 years	1
4.	Welding Machine	10 years	1
5.	Tipper	10 years	1

: its shall be responsibility of contractor to provide any other equipment as needed to successfully execute the work as per the contract.

- b. The T&P/ equipment /machinery specified in above Table shall be owned/leased by the contractor, Scanned copy of ownership/leased documents shall be uploaded in prescribed template, failing which Price Bid (envelope No 2) shall not be opened.

**Note:**

- The bidder shall submit documentary evidence of ownership of above machineries.
- IF SCADA is not readily available, the contractor has to submit undertaking of installing SCADA within one month after issue of work order.
- Lowest Bidder shall submit such certificate of fitness within one Month of opening of financial bid.

**2.23.4 Table 6: List of Key Personnel to be deployed on Contract Work**

S. No.	Personnel	Qualification	Required Nos.
1	Civil Engineer	B.E. (Civil) /B.Tech (Civil) + 15 Years Experience	1 No.
2	Site Engineer	B.E. (Civil)/ + 10 Years Experience	1 No
3	Site Supervisor	Diploma Civil+ 5 Years Experience	1 No

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4	Survey Engineer	B.E. (Civil)/ + 5 Years Experience or Diploma Civil+ 8 Years Experience	1 No
	Total		4 Nos

Note: It shall be responsibility of contractor to deploy suitably qualified human resources as needed (in addition to list of key personnel) to successfully execute the work as per the contract.

- a. Bidder shall submit the name and C.V.s of above Personnel in envelope no 1. If CV doesn't fulfil the requirement of qualification mentioned above, Price Bid (Envelope 2) shall not be opened.
- b. If Bidder fail to upload C.V's of Key Personnel, then Bidder shall be given 48 hrs time to submit the same, failing which Price Bid (envelope No 2) shall not be opened.

**2.23.5** Even though the bidders meet the above qualifying criteria, they are subjected to be disqualified if they have made misleading or false representation in the forms statement and attachments submitted as proof of the qualification requirements and / or record of past performance such as abandoning the works, not properly completing the contract, in ordinate delays in completion litigation history or financial failures etc.

The requirements of qualification criteria are tabulated in the following Table;

**Table 7: Brief details of Qualification Criteria**

S. No.	Qualification Criteria	Documentary Evidence
1	Minimum Average Financial Turnover as mentioned in Section 2.23.1	Chartered Accountant
2	Satisfactory completion of similar works as per section 2.23.2	Experience certificate issued by the officer of the rank of Executive Engineer or above. Copies of contracts should be enclosed showing the required quantities of items, along with completion certificates of such completed works.
3	Availability of the equipment owned and leased	Own or leased proof

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	for this work as per section 2.23.3	
5	Availability of key personnel with adequate experience for this work as per section 2.23.4	Degree/Diploma certificates and copies of appointment offers/willingness (undertaking) & experience certificates
6	Bid capacity as per section 2.23.2	Turnover of last 5 years, and ongoing commitments etc as per section 2.23.2

2.23.5 The Hard copy of Uploaded Document in Envelope No.1 should be submitted to the office of the ASCDCL.

### 2.23.6 ENVELOPE No. 2: PRICE/FINANCIAL BID

~~Offer has to be submitted online. Additional performance Security shall be submitted in prescribed form in case tendered rates are found below 1% of amount put to tender.~~

### 2.23.7 SUBMISSION OF TENDER :

Refer to website The Maharashtra Govt tenders information system <https://mahatenders.gov.in> for details.

### 2.23.8 OPENING OF TENDERS:

On the date, specified in the Tender Schedule, following procedure will be adopted for opening of the Tenders/bids.

a. ENVELOPE No. 1 : ( Technical Bid)

First of all Envelope No. 1 of the tender will be opened online to verify its contents as per requirements. If the various documents contained in this envelope do not meet the requirements of the Department, a note will be recorded accordingly by the tender opening authority and the said tenderer's Envelope No. 2 will not be considered for further action and the same will be recorded.

The decision of the tender opening authority in this regard will be final and binding on the contractors.

b. ENVELOPE No. 2: (Price/Financial Bid)

This envelope shall be opened online after opening of Envelope No. 1, only if contents of Envelope No. 1 are found to be acceptable to the Department and technical bid eligible. The tendered rates in Schedule 'B' or percentage above/below the estimated rates shall then be read out in the presence of bidders who remain present at the time of opening of Envelope No. 2.

### **2.23.9 Deposits and Payment**

#### **2.23.9.1 SECURITY DEPOSIT :**

- a. The successful tenderer whose tender is accepted will have to pay 2% of the amount of accepted tender value towards the Security Deposit in the form of bank guarantee of scheduled bank, DD, F.D.R. of the Nationalised or scheduled bank / Government Securities duly pledged in the name of the CEO, Aurangabad Smart City Development Corporation Limited towards the initial Security Deposit, valid within the time limit prescribed in clause 1 of B-1 Form, valid till completion of defect liabilities period failing which his earnest money/bid security will be forfeited to Government.
- b. In addition to the above, an amount of 3% of the accepted tendered value will be deducted from the each running bills at 1% of value of the gross bill towards balance security deposit till total amount is recovered. This is a compulsory deduction.
- c. A proforma for submission of security deposit in the form of Bank Guarantee (BG) is given in Annexure-11.

### **3. ELIGIBLE BIDDER AND SELECTION PROCESS**

#### **3.1 Eligible Bidder**

For determining the eligibility of Bidder, the following shall apply:

- a. The bidder should meet the criteria of eligibility.
- b. Bidder may be a natural person or private entity.
- c. Joint venture is not allowed
- d. A Bidder shall not have a conflict of interest (the “Conflict of Interest”) that affects the Bidding Process as defined in the tender documents.
- e. Bidder shall upload all the documents as required.
- f. Bidder shall deposit the earnest money/bid security of required amount and in prescribed form.

#### **3.2 Selection Process of Bidders**

- a. The Bids shall be opened by ASCDCL in the presence of the Bidders or their representatives who choose to attend. The representatives of the bidders are advised to carry identity cards or a letter addressed to ASCDCL identifying that they are bonafide representatives of the bidder firm, for attending the opening of bid. There will be three bid-opening events:
  - STAGE 1 (Key Submissions)
  - STAGE 2 (Technical bids)
  - STAGE 3 (Price/Financial bids)
- b. The date and time for opening of Price/Financial bids would be communicated to the qualified bidders.

### **3.3 Preliminary Examination of Bids**

ASCDCL shall examine the bids to determine whether they are complete, the documents have been properly signed and whether the bids are generally in order. Any bids found to be non-responsive for any reason or not meeting any criteria specified in the RFP, shall be rejected by ASCDCL and shall not be included for further consideration. Earnest Money (EMD)/Bid scrutiny shall be held and bids will be treated as non-responsive, if bids are:

- a. Not submitted in format as specified in the RFP document
- b. Received without the Letter of Authorization (Power of Attorney)
- c. Received without paying tender fee
- d. Found with suppression of facts/details
- e. With incomplete information, subjective, conditional offers and partial offers submitted
- f. Submitted without the documents requested
- g. Non-compliant to any of the clauses mentioned in the RFP
- h. With lesser validity period
- i. EMD/Bid security not deposited/ not deposited as required

### **3.4 Clarification on Bids**

During the bid evaluation, ASCDCL may, at its discretion, ask the Bidder for any clarification(s) of its bid. The request for clarification and the response shall be in writing, and no change in the price or substance of the bid shall be sought, offered, or permitted. Clarifications shall be obtained only in pre-historic information like bidders' credentials.

### **3.5 Bid Parameter**

The Bid shall comprise the rates quoted by the Bidder in accordance with the provisions of the bid document. Subject to Clauses 2.23 of this RFP, the Bidder who offers the lowest rates shall ordinarily be selected for award of work subject to the provisions of Clause 2.19 and elsewhere mentioned in the document, the Price/Financial Bids of all the Bidders whose Bids are adjudged as responsive and thereafter found eligible in the evaluation of Technical Bids shall be opened to determine the lowest Bidder.

In the event of two or more Bidders quote the same lowest rates (the "Tie Bidders"), on being called upon by ASCDCL, the financial offer shall be submitted again by such lowest bidders to break the tie. The revised offer shall, however, not be more than the originally quoted figure. Any revised offer more than the original offer shall be liable to be rejected.

In case of difference in the offer quoted by the bidder in figures and the words, the offer/rates quoted in words shall prevail.

### **3.6 Evaluation Process**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

ASCDCL shall constitute a Tender Evaluation Committee to evaluate the responses of the bidders. The Tender Evaluation Committee shall evaluate the responses to the RFP and all supporting documents/documentary evidence. Inability to submit requisite supporting documents/documentary evidence by bidders may lead to rejection of their bids. The decision of the Tender Evaluation Committee in the evaluation of bids shall be final. No correspondence will be entertained outside the process of evaluation with the Committee. The Tender Evaluation Committee may ask for meetings or presentation with the Bidders to seek clarifications or confirmations to their bids.

Each of the responses shall be evaluated as per the criteria and requirements specified in this RFP. The steps for evaluation are as follows:

### **3.6.1 Technical Evaluation**

Technical proposals will be evaluated for their compliance of responsiveness to various bid requirements. ASCDCL will carry out a detailed evaluation of the Bids in order to determine whether the technical aspects are in accordance with requirements set forth in the Bid Documents. In order to reach such a determination, the ASCDCL will examine and compare the various technical aspects of the Bids on the basis of the information supplied by the Bidders for overall completeness and compliance and deviations from the ASCDCL requirements to the Proposal/conditions. The Bid that does not meet minimum acceptable standards of completeness, consistency and detail will be categorized as non responsible and shall be liable for rejection.

### **3.6.2 Opening of Price/Financial Bids and Evaluation**

After the technical evaluation, ASCDCL shall invite bidders to attend the opening of Price/Financial Bids who have been determined as technically qualified. The schedule and venue for opening of Price/financial bids shall be duly intimated to the substantially responsive and technically qualified bidders well in time.

### **3.7 Contacts during Bid Evaluation**

Bids shall be deemed to be under consideration immediately after they are opened and until such time the ASCDCL makes official intimation of award/ rejection to the Bidders. While the Bids are under consideration, Bidders and/ or their representatives or other interested parties are advised to refrain, save and except as required under the Bidding Documents, from contacting by any means, the ASCDCL and/ or their employees/ representatives on matters related to the Bids under consideration.

## **4 AWARD OF CONTRACT**

### **4.1 Notification of Award**

ASCDCL will notify the successful Bidder in writing by e-mail followed by courier/registered/speed post.

### **4.2 Signing of Contract**



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- a. After the notification of award, ASCDCL will issue Letter of Award (“LOA”) and the contract shall be signed between successful bidder and ASCDCL. As an acceptance of the LOA, the Bidder shall sign and return back a duplicate copy of the LOA to ASCDCL along with Security Deposit within 10 days from the date of issuance of LOA.
- b. On receipt of the Performance Security, ASCDCL or the agency designated by ASCDCL shall enter into an Agreement with the successful bidder.

### **4.3 Security Deposit and Additional Performance Security**

- a. Within ten (10) days from the date of issuance of LOA, the successful Bidder shall at his own expense submit Security Deposit @ 2% of tendered amount rounded to next Rs 1000 in the form of DD/FDR/Government Securities/unconditional and irrevocable Performance Security of in favour of “The CEO, ASCDCL”. The Bank Guarantee shall be from a Nationalized/Scheduled Bank in the format prescribed in Annexure 11 of this RFP, payable on demand, for the due performance and fulfilment of the contract by the bidder.
- b. The Security Deposit shall be invoked by ASCDCL, in the event the Bidder:
  - i. Fails to meet the overall conditions as mentioned in RFP or any changes agreed between the parties,
  - ii. Fails to perform the responsibilities and obligations as set out in the RFP to the complete satisfaction of ASCDCL,
  - iii. Misrepresents facts/information submitted to ASCDCL
- c. The Security Deposit shall be valid two months beyond the completion of defect liability period. The Security Deposit may be discharged/returned by ASCDCL upon being satisfied that there has been due performance of the obligations of the bidder under the contract. However, no interest shall be payable on it.
- d. In the event of the Bidder being unable to service the contract for whatever reason(s), ASCDCL shall have the right to invoke the security notwithstanding and without prejudice to any rights whatsoever of ASCDCL under the contract.

#### **4.3.1 Additional Performance Security**

Additional Performance Security shall be made as per following calculation.

- i. If the tenderer quotes his offer 1% to 10% below the cost put to tender, he shall submit the Demand Draft / FDR / Bank Guarantee of the amount equal to 1% of cost put to tender.
- ii. If the offer quoted is more than 10% below but less than or upto 15% below the cost put to tender, the tenderer shall submit the Demand Draft / FDR / Bank Guarantee of the cumulative amount which is equal to the amount by which offer is more than 10% below plus the amount as per (i) above (For example, for 14% below rate : 1% + (14% - 10%) i.e.4% thus total 5%)
- iii. If the offer quoted is more than 15% below the cost put to tender, the tenderer shall submit the Demand Draft / FDR / Bank Guarantee double amount for remaining amount in addition to above. (For example, for 19% below rate: (19%

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- 15%) =  $4\% * 2 = 8\%$ ). Thus, if the offer quoted is more than 15% below the cost put to tender, the tenderer shall submit the Demand Draft / FDR / Bank Guarantee as for example: for 19% below rate : (1% + (15%- 10%) i.e.5% thus total 6%) + (19%- 15%)=  $4\% * 2 = 8\%$ ) i.e., total 14%)

### Note:

- If the Performance Security of **Demand Draft / FDR / Bank Guarantee** amount below Rs.1000/- then Demand Draft should be at least for Rs. 1000/-.
- Submit the **Demand Draft / FDR / Bank Guarantee from Nationalized/Scheduled Bank** of the commutative amount which should be rounded off to next hundred rupees.
- Additional performance security is permitted to be accepted in the form of DD/ FDR/ BG of any Nationalized/ Scheduled Bank. ~~This shall be enclosed in the financial/price bid envelope (Envelope no.2). A self attested affidavit that 'Additional Performance Security is enclosed in envelope No.2' shall be included in the Technical Bid Envelope No.1.~~
- ~~If the Additional Performance Security is not found included in envelope No.2 (financial envelope) (in cases which are found below 1 % of amount put to tender) the offer shall be treated as invalid and rejected forthwith.~~
- Additional Performance Security of the successful bidder shall be returned immediately upon satisfactory completion of work; the certificate of which shall be issued by the ASCDCL before releasing the additional security.
- Additional Performance Security for tenders below estimated costs shall be released on the day of opening of the financial bid except for L-1 and L-2. The Additional Performance Security of L-2 shall be released within time limit of 30 subsequent working days or award of work to L-1, whichever is later.

## 5 FAILURE TO COMPLY WITH THE TERMS & CONDITIONS OF THE RFP

- a. Failure of the successful bidder to comply with the Terms & Conditions of the RFP shall constitute sufficient grounds for the annulment of the award, in which event ASCDCL may award the contract to the next best value bidder or call for fresh bids.
- b. In such a case, ASCDCL shall invoke the PG and/or forfeit the EMD/Bid security.

## 6 MISCELLANEOUS

- a. The Bidding Process shall be governed by, and construed in accordance with, the laws of India and including but not limited to laws of Government of Maharashtra in force and as amended from time to time; and the Courts in Aurangabad shall have exclusive jurisdiction in all disputes arising under, pursuant to and/ or in connection with the Bidding Process.
- b. The ASCDCL, in its sole discretion and without incurring any obligation or liability, reserves the right, at any time, to;

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- i. Suspend and/ or cancel the Bidding Process and/ or amend and/ or supplement the Bidding Process or modify the dates or other terms and conditions relating thereto;
  - ii. Consult with any Bidder in order to receive clarification or further information;
  - iii. Retain any information and/ or evidence submitted to the ASCDCL by, on behalf of, and/ or in relation to any Bidder; and/ or
  - iv. Independently verify, disqualify, reject and/ or accept any and all submissions or other information and/ or evidence submitted by or on behalf of any Bidder.
- c. It shall be deemed that by submitting the Bid, the Bidder agrees and releases the ASCDCL, its employees, agents, consultants and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/ or performance of any obligations hereunder, pursuant hereto and/ or in connection with the Bidding Process and waives, to the fullest extent permitted by applicable laws, any and all rights and/ or claims it may have in this respect, whether actual or contingent, whether present or in future.

### **6.1 Stamp Duty**

The contractor shall bear the revenue stamp duty on total security deposit of the agreement and/or Additional Performance Security Deposit (payable as per tender condition), as per the Indian Stamp Duty (1985) (latest revision) provision applicable during contract period.

### **6.2 Guidelines for Submission of Tender**

- 6.2.1 The guidelines, “to download the tender document and online submission of bids procedure of tender opening” can be downloaded from website: <https://mahatenders.gov.in>.
- 6.2.2 The date and time for online submission shall strictly apply in all cases. The tenderers should ensure that their tender is prepared online before the expiry of the scheduled date and time and then submitted online before the expiry of the scheduled date and time. Offers not submitted online shall not be entertained.
- 6.2.3 If for any reason, any interested bidder fails to complete any of online stages during the complete tender cycle, ASCDCL shall not be responsible and any grievance regarding that shall not be entertained.
- 6.2.4 Any erasures made in the tender documents may result in rejection of tender.
- 6.2.5 In case, the tenderer or in case of firm or company authorized person does not sign the tender documents in the place provided for the purpose, and as required, it is liable for rejection.
- 6.2.6 If the tendering contractors are a partnership firm or company, they shall in their forwarding letter should mention the names of all the partners of the firm or the company as the case may be and the names of the partners who hold the power of attorney authorizing him to conduct transactions on behalf of the Company/Firm.
- 6.2.7 Rules and conditions of the contract are subject to amendment till the time of acceptance of tender.

**6.3 Signing of Contract**

As the ASCDCL notifies the successful Bidder that the bid has been accepted, the ASCDCL shall send the Bidder an acceptance letter informing the Bidder, the further necessary line of action including signing of contract etc.

**6.4 Approvals**

Responsibility of Engineer in Charge regarding getting approvals and permissions from local bodies will be limited to extending all possible help in solving local problems for obtaining permission, obtaining power supply etc.

**APPENDICES AND ANNEXURES**

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Bidder shall submit all pre-bid queries in the following format with the subject capturing the name of the RFP.

**Appendix - 1 Template for Pre-Bid Queries**

<b>Sl. No.</b>	<b>RFP Volume/Section</b>	<b>RFP Page No.</b>	<b>Content in the RFP</b>	<b>Clarification sought</b>

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 1: Bid Covering Letter**

Date: dd/ mm / yyyy

To,

The Chief Executive Officer,  
Aurangabad Smart City Development Corporation Limited  
Ambedkar Research Centre, Near Amkhas Maidan,  
Aurangabad-431005

**Sub: RFP for CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI,  
AURANGABAD**

Ref: RFP No. .... dated ....

Dear Sir,

With reference to your “**Request for Proposal for CONSTRUCTION OF SMART CITY  
BUS DEPOT AT MUKUNDWADI, AURANGABAD**”

We hereby submit our Pre-qualification/ Technical Bid and Price Bid (Financial Bid) for the same.

1. I / We, having examined all relevant documents and understood their contents, hereby submit our Bid for subject project. The Bid is unconditional and unqualified.
2. I/We acknowledge that the ASCDCL will be relying on the information provided in the Bid and the documents accompanying the Bid, and we certify that all information provided in the Bid and in the Annexures & Appendices, are true and correct, nothing has been omitted which renders such information misleading; and all documents accompanying such Bid are true copies of the respective originals.
3. I / We shall make available to the ASCDCL any additional information it may deem necessary or require for supplementing or authenticating the Bid.
4. I / We acknowledge the right of the ASCDCL to reject our application/bid without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.
5. I / We certify that in the last five years, we have neither failed to perform on any contract, as evidenced by imposition of a penalty by an arbitral or judicial authority or a judicial pronouncement or arbitration award against the Bidder, nor been expelled from any project or contract by any public authority nor have had any contract terminated by any public authority for breach on our part.
6. I/We declare that:
  - a. We have examined and have no reservations to the RFP Documents, including any Addendum issued by the Authority;
  - b. I / We do not have any conflict of interest as mentioned in the RFP Document;
  - c. I / We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in respect of any tender or request for proposal issued by or any agreement entered into with the Authority or any other public sector enterprise or any government, Central or State; and
  - d. I/We hereby certify that we have taken steps to ensure that in conformity with the provisions of this RFP, no person acting for us or on our behalf will engage in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.

AURANGABAD SMART CITY DEVELOPMENT CORPORATION LIMITED

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

7. I / We understand that you may cancel the Selection Process at any time and that you are neither bound to accept any Bid that you may receive, without incurring any liability to the Bidders in accordance with the RFP document.
8. I/We certify that in regard to matters other than security and integrity of the country, we or any of our Associates have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory authority which would cast a doubt on our ability to undertake the work for the Project or which relates to a grave offence that outrages the moral sense of the community.
9. I / We further certify that in regard to matters relating to security and integrity of the country, we have not been charge-sheeted by any agency of the Government or convicted by a Court of Law for any offence committed by us or by any of our Associates.
10. I/We hereby irrevocably waive any right or remedy which we may have at any stage at law or howsoever otherwise arising to challenge or question any decision taken by the ASCDCL (and/ or the Government of India) in connection with the Selection Process itself in respect of the above mentioned Project.
11. I/We agree and understand that the Bid is subject to the provisions of the RFP document. In no case, shall I/we have any claim or right of whatsoever nature if the work is not awarded to me/us or our Bid is not opened or rejected.
12. I / We agree to keep this offer valid for 120 (One hundred and twenty) days from the Bid Due Date as specified in the RFP.
13. In the event of my/our firm being selected, I/we agree and undertake to carry out the work in accordance with the provisions of the RFP and that our team represented by the team leader shall be responsible for providing the agreed services and not through any other person or Associate.
14. We have studied RFP and all other documents carefully. We understand that we shall have no claim, right or title arising out of any documents or information provided to us by the ASCDCL or in respect of any matter arising out of or concerning or relating to the Selection Process including the award of the work.
15. I do hereby declare that the documents submitted in envelope No. 1 of the tender document for the work are true, correct and complete. In case, the contents of envelope No. 1 and other documents pertaining to the tender submitted by me/us are found to be incorrect or false, I/we shall be liable for action under the relevant provision of Indian Penal Code and other relevant laws.
16. I/We agree and undertake to abide by all the terms and conditions of the RFP Document.
17. Brief details of my/our particulars are attached herewith in Appendix – 2 and declaration & certificate attached in Appendix – 3 and 4.
18. In witness thereof, I/we submit this Bid under and in accordance with the terms of the RFP Document.

In case of any clarifications please contact \_\_\_\_\_ email at \_\_\_\_\_.

---

Thanking you,

Yours sincerely,

AURANGABAD SMART CITY DEVELOPMENT CORPORATION LIMITED



CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

(Signature of the bidder)

Printed Name

Designation

Seal

Place:

Business Address:

Mobile no.

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Appendix 2: Details of ----- Bidder/Contractor's name)**

<b>S. No.</b>	<b>Particulars</b>	<b>Details</b>
1	Name of the Bidder	
2	Legal status of Bidder (Individual, company, Pvt. Ltd., LLP etc.)	
3	Registered office address	
4	Registration details/Organisation	
5	GST Number	
6	PAN details	
7	Primary Contact Person (Name, Designation, address, mobile number, fax, email)	
8	Secondary Contact Person (Name, Designation, address, mobile number, fax, email)	
9	EMD/BID SECURITY Details	
10	Brief description of the Company including details of its registration:	
11	A statement by the Bidder or any of their Associates disclosing material non-performance or contractual non-compliance in past projects, contractual disputes and litigation/ arbitration in the recent past is to be given below (Attach extra sheets, if necessary).	

(Signature of contractor)

Name of Contractor

Date

Place

**Appendix 3: Declaration by Contractor**

**DECLARATION**

1. I/we have visited the site of work before quoting the tender and got myself /ourselves acquainted with the site conditions and site requirements for the work.
2. I/we hereby declare that I/we have made myself/ourselves thoroughly conversant with the local conditions regarding all materials, such as stones, murum, sand, their leads, availability of water and labour on which I/we have quoted my bid for this work.
3. The specifications , conditions and clauses of this work have been carefully studied and understood by me/us before submitting the tender.
4. I/we undertake to use only the best materials, to be approved by the Engineer in charge of the work or his duly authorized representative, before starting the work and also to abide by his decision.
5. I/we hereby undertake to pay the labours engaged on the work as per Minimum Wages Act 1984 applicable to the zone concerned.
6. I/We shall replace repair and adjust free of all charges to the employer any part of the work which fails to comply with the Specifications or amendment to such specifications as referred to in our specifications attached to tender, except fair wear and tear until the completion and for a period mentioned under defect liability period.
7. All the work shall be of a type which has been proved in service to be suitable for the purpose required by the specifications and shall be tested in accordance with the appropriate standard specifications approved by the Engineer-in-charge.
8. I/We accept and abide by the clause relating to quality and guarantee of work.

Date:

Place:

Contractor's Signature

**Appendix 4: Certificate**

1. I/we, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.
2. The undersigned also hereby certifies that neither our firm  
M/s ----- have abandoned any work on Building/ Bridges/ Roads etc. nor any contract awarded to us for such works have been rescinded, during last five years prior to the date of this bid.
3. The undersigned hereby authorize (s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.
4. The undersigned understands and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the Department/ASCDCL.
5. It is certified that Additional Performance Security (in case tendered rates are below 1% of amount put to tender) amounting to Rs.-----in the form of DD/FDR/BG bearing no. ----- from (Name of Bank) has been included in the Envelope no. 2 as required in the tender documents. I am also aware if the Additional Performance Security as required in the tender documents is not found in Envelope No. 2, my/our Bid shall be declared invalid and rejected forthwith.

(Signed by Contractor/an Authorised representative of the Firm)

Name

Designation

Date

Place

**CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD**

**Annexure 2: Format for Bidder's Similar Experience**

Project /Name of work	Name of the Employer	Description of work	Contract No.	Value of Contract (Rs. lakhs)	Date of Issue of work order	Quantity executed of RCC Work (M20) and above (Cum)	Actual date of completion	Remarks explaining reasons for delay & work completed
					Stipulated Date of completion	Quantity of TMT/HYSD steel execute (MT)		

Note:

- Clearly bring out the experience details to be reckoned for evaluating the Technical Bid in terms of fulfilment of Qualification Criteria (Clause 2.23);
- The claimed experience shall be supported by (i) Work Orders/copies of agreements and certificates from the Client.
- Quantities of RCC and steel (TMT/HYSD) are to be given project wise.

Signature \_\_\_\_\_

Name \_\_\_\_\_

Designation \_\_\_\_\_

Company \_\_\_\_\_

Date \_\_\_\_\_

Notes:

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 3: Details of the Bidder**

(Format of affidavit to be given on Rs. 500 Non-Judicial Stamp Paper)

I..... Age ..... years, address .....

(Authorised signatory to sign the contract), hereby submit, vide this affidavit in truth, that I am the owner of the contracting firm ...../ authority signatory and I am submitting the documents in envelope no.1 for the purpose of scrutiny of the contract (**Name of Work: CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD.** I hereby agree to the conditions mentioned below:-

1. I am liable for action under Indian Penal Code for submission of any false / fraudulent paper / information submitted in envelope No.1.
2. I am liable for action under Indian Penal Code if during contract period and defect liability period, any false information, false bill of purchases supporting proof of purchase, proof of testing submitted by my staff, subletting company or by myself, I will be liable for action under Indian Penal Code.
3. I am liable for action under Indian Penal Code if any papers are found false /fraudulent during contract period and even after the completion of contract (finalisation of final bill).

Signature of Authorised person.....

Applicant/Contractor Name.....

Address.....

Place : .....

Date :-.....

E-mail.....

Mobile,,,,.....

Website.....

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 4: List of Key Personnel to be deployed on Contract Work**

<b>S. No.</b>	<b>Personnel</b>	<b>Qualification</b>	<b>Required Nos.</b>
1	Civil Engineer	B.E. (Civil) /B.Tech (Civil) + 15 Years Experience	1 No.
2	Site Engineer	B.E. (Civil)/ + 10 Years Experience	1 No
3	Site Supervisor	Diploma Civil+ 5 Years Experience	2 No
4	Survey Engineer	B.E. (Civil)/ + 5 Years Experience or Diploma Civil+ 8 Years Experience	1 No
	Total		5 Nos

Note: It shall be responsibility of contractor to deploy suitably qualified human resources as needed (in addition to list of key personnel) to successfully execute the work as per the contract.

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 4 A: Sample format for Curriculum Vitae (CV) of key personnel**

<b>Criteria</b>	<b>Details</b>	
Proposed Position		
Name		
Nationality		
Date of birth		
PAN		
Educational Qualifications		
Employment record /Experience (Starting with present position, list in reverse order every employment held.)		
Details of the current assignment and the time duration for which services are required for the current assignment.		
List of projects on which the Personnel has worked	Name of projects	Description of responsibilities

**Certification:**

1. I am willing to work on the Project and I will be available for entire duration of the Project assignment as required.
2. I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications and my experience

**Note ;**

1. Bidder shall submit the name and C.V.s of above Personnel in envelope no 1. If CV doesn't fulfil the requirement of qualification mentioned above, Envelope 2 shall not be opened
2. If Bidder failed to upload C.V's of Key Personnel, then Bidder shall be given 48 hrs time submit the same, failing which envelope No 2 shall not be opened.



CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 5: Power of Attorney for Signing of Bid**

Know all men by these presents, We \_\_\_\_\_ (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr. / Ms (Name) \_\_\_\_\_, son/daughter/wife of \_\_\_\_\_ and presently residing at \_\_\_\_\_, who is presently employed with us and holding the position of \_\_\_\_\_ as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our bid for the work "CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

) proposed or being developed by Aurangabad Smart City Development Corporation Limited (ASCDCL) (the "Authority") including but not limited to signing and submission of all applications, bids and other documents and writings, participate in bidders' and other conferences and providing information / responses to the Authority, representing us in all matters before the ASCDCL/Authority, signing and execution of all contracts including the Agreement and undertakings consequent to acceptance of our bid, and generally dealing with the ASCDCL/Authority in all matters in connection with or relating to or arising out of our bid for the said work/Project and/or upon award thereof to us and/or till the entering into of the Agreement with the ASCDCL/Authority.

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

IN WITNESS WHEREOF WE, \_\_\_\_\_, THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_.

For \_\_\_\_\_  
(Signature, name, designation and address)

Witnesses:

1.

2.

Accepted Notarised

(Signature, name, designation and address of the Attorney)

**Note: To be submitted in original**

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

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 6: Format for Financial Statement**

(On Chartered Accountant/Statutory Auditor's letterhead)

I hereby declare that I have scrutinized and audited the financial statements of M/s\_\_\_\_\_ .The annual turnover of the Company/firm for the five years from 2015-16 is as follows:

<b>Year</b>	<b>Average Annual Turnover (INR)</b>
2015-16	
2016-17	
2017-18	
2018-19	
2019-20	

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 7: Details of T&P/Machinery available with the tenderer for use on this work**

<b>S. No.</b>	<b>Name of equipment</b>	<b>No. of units</b>	<b>Name of make</b>	<b>Capacity</b>	<b>Age &amp; condition</b>	<b>Remarks</b>

**Annexure 8: Declaration of Non-Blacklisting**

**DECLARATION OF NON-BLACKLISTED STATUS**

*(To be provided on the Company letter head)*

**Declaration for Bidder:**

Place:

Date:

To,  
The Chief Executive Officer,  
Aurangabad Smart City Development Corporation Limited

Subject: Self Declaration of not been blacklisted in response to the

Ref: RFP No. ....**dated** .....

Dear Sir,

We confirm that our company/firm, \_\_\_\_\_, is currently not blacklisted in any manner whatsoever by any of the State or UT and or Central Government in India on any ground including but not limited to indulgence in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice.

(Signature of the Bidder)

Printed Name

Designation

**Seal**

Business Address:

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 9: No Deviation Certificate**

This is to certify that our offer is exactly in line with your tender enquiry/ RFP (including amendments) no. \_\_\_\_\_ dated \_\_\_\_\_. This is to expressly certify that our offer contains no deviation either Technical (including but not limited to Scope of Work, Design, Technical Specifications and other requirements) or Commercial in either direct or indirect form.

(Authorised Signatory)

Signature:

Name:

Designation:

Address:

Seal:

Date:

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 10: Existing Commitments and ongoing works**

**(A) Existing commitments and on-going works :**

Description of work	Place & State	Contract No.	Name & Address of employer	Value of Contract (Rs. Cr.)	stipulated period of completion	Value of works* remaining to be completed	Anticipated date of completion .
1	2	3	4	5	6	7	8

1. Attach certificate(s) from the Engineer(s)-in-charge.

2. The item of works for which data is requested should tally with that specified in bid capacity calculation.

3. \* on 1<sup>st</sup> April 2020.

**(B) Works for which bids already submitted:**

Description of work	Place & state	Name & address of employer	Estimated cost of works	Stipulated period of completion	Date when decision is expected	Remarks

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 10A: Calculation of bid capacity made by the Contractor**

A = Maximum annual turnover of civil engg. Works excluding private works during last five years in lakhs	N = Time in which the work is to be completed in years (N to be taken as 1)	B = Ongoing works and existing commitments, in lakhs	Bid capacity in lakhs = $2 \times A \times 1 - B$

**Note:**

1. The calculation will be based on required certificates
2. The details of “A” and “B” may be worked out and submitted with the calculation
3. The Bid capacity shall be more than the estimated cost put to tender for post qualification
4. The calculation if not found correct and not based on attached certificates will be corrected by ASCDCL as per attached certificates by the contractor.



**Annexure – 11: FORM OF BANK GUARANTEE**

In consideration of the CEO, Aurangabad Smart City Development Corporation Limited (hereinafter called "ASCDCL having agreed to exempt hereafter called "The said contractor") from the demand, under the terms and conditions of an Agreement dated (hereafter called "the said Agreement") made between the ASCDCL and the said contractor for the Security Deposit for the due fulfilment by the said contractor of the terms and conditions contained in the said Agreement, on production of the Bank Guarantee for Rs-----  
------(in figures) (Rs------(in words) we, (hereinafter referred to as "the Bank" at the request of the said contractor do hereby undertake to pay to the ASCDCL an amount not exceeding the above said amount of Guarantee against any loss or damage caused to or would be caused to or suffered by the ASCDCL by reason of any breach by the said contractor or any of the terms or conditions.

2. We, \_\_\_\_\_ do hereby undertake to pay the amounts due and payable under this Guarantee without any demur, in hereby on a demand from the ASCDCL stating that the amount claimed is due by way of loss or damage caused to or would be to or suffered by the ASCDCL by reason of breach of the said contractor of any of the terms or condition contained in the said agreement or any reason of the contractor's failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding the above said amount Guarantee.

3. We undertake to pay to the ASCDCL any money so demanded notwithstanding any dispute or disputes raised by the Contractor in any suit or proceeding pending before any court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor shall have no claim against us for making such payment

4. We \_\_\_\_\_ further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continued to be enforceable till all the dues of the ASCDCL under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged till ASCDCL certified that the terms and conditions of the said Agreement have been duly and properly carried out by the said contractor and accordingly discharges this guarantee unless a demand or claim under this guarantee is made on us in writing on or before we shall be discharged from all liability under this guarantee thereafter.

5. We \_\_\_\_\_ further agree that ASCDCL shall have the fullest liberty without our consent and without affecting in any manner our obligations here under to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by the ASCDCL against the said contractor and to forbear or enforce any of the terms and conditions relating to the said Agreement, and we shall not be relieved from any liability by reason of any such variation, or extension being granted to the said contractor, or for any forbearance act or omission on the part of the ASCDCL any indulgence by the ASCDCL to the said contractor or by any such matter or thing whatsoever which under the law to sureties would, but for this provisions, have effect of so relieving us.

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

This guarantee shall not be discharged due to the change in the constitution of the Bank or of the Contractor.

7. We, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the ASCDCL in writing.

*Dated the day of 2021*

For \_\_\_\_\_  
(Indicate the name of the Bank)

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**ANNEXURE- 12 COLLABORATION AGREEMENT**

This agreement made at -----(Place) this day -----(date, month and year) between M/s. -----(Name of the bidder, who intends to collaborate and its registered office address) here-in-after referred as (Principal contractor) which expression shall unless it be repugnant to the context or contrary to the meaning there of be deemed to mean and includes its successors in business and permitted assigns of the ONE PART and M/s -----(name of the collaborator and its registered address) here-in-after referred as (Collaborator) which expression shall unless it be repugnant to the context or contrary to the meaning there of be deemed to mean and includes its successors in business and permitted assigns of the OTHER PART.

**WHEREAS**

- 1) ASCDCL has floated a tender for the work CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD ),
- 2) (Principal contractor) -----registered with ASCDCL/MCGM/MIDC/CIDCO/ANY GOVT ORGANIZATION in Class -----is a well established contractor engaged in the activities of construction of buildings and roads,
- 3)(Collaborator) -----Registered with Maharashtra Jeevan Pradhikran/MIDC/MCGM/CIDCO/ANY GOVT in Civil/Mechanical Class-----is well established contractor having the experience of -----(details of works),
- 4) The principal contractor desires to collaborate with the collaborator for execution of following works, as he don't have sufficient experience of this particular work included in tender as mentioned in para 1 above.

<b>Sr.No.</b>	<b>Name of work</b>	<b>Amount</b>
	Total	

(Note :-It is obligatory to furnish above information otherwise collaboration agreement shall not be considered).

5) The Parties hereto have come together to set up a collaboration in order to quote for the tender mention in para 1 above and on award of the tender to jointly execute the work as mentioned in para 4 above as well as to guarantee it's perfect execution utilizing the technical experience. The principal contractor involved in this collaboration, directly or indirectly shall hold fully responsible towards ASCDCL to look after the execution of the said work as per the terms and conditions and specifications mentioned in tender.

**NOW IT IS HEREBY AGREED BY AND BETWEEN THE PARTIES HERETO AS UNDER :-**

1) In consideration of the mutual understanding, trust and confidence each of the parties in other, they have mutually agreed to form a collaboration to submit the tender and if the tender is accepted by the ASCDCL then carry on the business as a collaboration in respect of

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

development and execution of the said work in accordance with the terms and conditions that may be imposed or agreed by and between the ASCDCL and the Principal contractor hereto.

2) The collaborator shall be responsible for completion of works for which the collaboration is made, however the principal contractor shall be ultimately responsible and liable for completion of entire works in accordance with the terms and conditions on which the award to execute the work is made by ASCDCL under the said tender.

3) In the event of any dispute or difference or misunderstanding arises between both of them in course of execution of the work after the award of the work to the Principal contractor by ASCDCL, the same shall be referred to Member Secretary, ASCDCL and his decision in this respect shall be final and binding on both the parties

IN WITNESS WHERE OF the parties hereunto have set and subscribed their respective hands and seals the day, month and year first above written.

SIGNED, SEALED AND DELIVERED  
BY THE WITH IN NAMED

**(Name of First Party)**

**(Name of Second Party)**

**WITNESS :-**

**1.**

**2**

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Annexure 13: Integrity Pact**

Between

AURANGABAD SMART CITY DEVELOPMENT CORPORATION LIMITED (ASCDCL)

having its Office at ASCDCL Office, War Room, Near Ambedkar Research Center, Aam Khaas Maidan,  
Aurangabad -431001, hereinafter referred to as "**ASCDCL**",

and

-----  
(Insert the name of the Sole Bidder/Firm)

having its Registered Office at (Insert full Address) hereinafter referred to as "The Bidder/Contractor"

Preamble

ASCDCL intends to award, under laid, contract for CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

ASCDCL values full compliance with all relevant laws and regulations, and the principles of economical use of resources, and of fairness and transparency in its relations with its Bidders/ Contractors. In order to achieve these goals, ASCDCL and the above named Bidder/Contractor enter into this agreement called 'Integrity Pact' which will form a part of the bid.

It is hereby agreed by and between the parties as under:

**Section I - Commitments of ASCDCL**

1. ASCDCL commits itself to take all measures necessary to prevent corruption and to observe the following principles:

a. No employee of ASCDCL, personally or through family members, will in connection with the tender, or the execution of the contract, demand, take a promise for or accept, for him/herself or third person, any material or other benefit which he/she is not legally entitled to.

b. ASCDCL will during the tender process treat all Bidder(s) with equity and fairness. ASCDCL will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

c. ASCDCL will exclude from evaluation of Bids its such employee(s) who has any personnel interest in the Companies/ Agencies participating in the Bidding/Tendering process

2. If CEO, ASCDCL obtains information on the conduct of any employee of ASCDCL which is a criminal offence under the relevant Anti- Corruption Laws of India, or if there be a

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## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

substantive suspicion in this regard, he will inform its Chief Vigilance Officer and in addition can initiate disciplinary actions under its Rules.

### **Section II-Commitments of the Bidder/Contractor**

1. The Bidder/Contractor commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution:

a. The Bidder/Contractor will not, directly or through any other person or firm, offer, promise or give to ASCDCL, or to any of ASCDCL's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange an advantage during the tender process or the execution of the contract.

b. The Bidder/Contractor will not enter into any illegal agreement or understanding, whether formal or informal with other Bidders/Contractors. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or actions to restrict competitiveness or to introduce cartelization in the bidding process.

c. The Bidder/Contractor will not commit any criminal offence under the relevant Anti-corruption Laws of India; further, the Bidder/Contractor will not use for illegitimate purposes or for purposes of restrictive competition or personal gain, or pass on to others, any information provided by ASCDCL as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d. The Bidder/Contractor of foreign origin shall disclose the name and address of the Agents/ representatives in India, if any, involved directly or indirectly in the Bidding. Similarly, the Bidder/Contractor of Indian Nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly In the Bidding.

e. The Bidder/Contractor will, when presenting his bid, disclose any and all payments he has made, or committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and/ or with the execution of the contract.

f. The Bidder/Contractor will not misrepresent facts or furnish false/forged documents/information's in order to influence the bidding process or the execution of the contract to the detriment of ASCDCL.

2. The Bidder/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

### **Section III- Disqualification from tender process and exclusion from future contracts**

1. If the Bidder, before contract award, has committed a serious transgression through a violation of Section II or in any other form such as to put his reliability or credibility as Bidder into question, ASCDCL may disqualify the Bidder from the tender process or terminate the contract, if already signed, for such reason.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

2. If the Bidder/Contractor has committed a serious transgression through a violation of Section II such as to put his reliability or credibility into question, ASCDCL may after following due procedures also exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder/Contractor and the amount of the damage. The exclusion will be imposed for a minimum of 12 months and maximum of 3 years.

3. If the Bidder/Contractor can prove that he has restored/recouped the damage caused by him and has installed a suitable corruption prevention system, ASCDCL may revoke the exclusion prematurely.

### **Section IV - Liability for violation of Integrity Pact**

1. If ASCDCL has disqualified the Bidder from the tender process prior to the award under Section III, ASCDCL may forfeit the Bid Guarantee under the Bid.

2. If ASCDCL has terminated the contract under Section III, ASCDCL may forfeit the Contract Performance Guarantee of this contract besides resorting to other remedies under the contract.

### **Section V - Previous Transgression**

1. The Bidder shall declare in his Bid that no previous transgressions occurred in the last 3 years with any other Public Sector Undertaking or Government Department that could justify his exclusion from the tender process.

2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

### **Section VI - Equal treatment to all Bidders/Contractors**

1. ASCDCL will enter into agreements with identical conditions as this one with all Bidders.

2. ASCDCL will disqualify from the tender process any bidder who does not sign this Pact or violate its provisions.

### **Section VII - Punitive Action against violating Bidders/Contractors**

1. If ASCDCL obtains knowledge of conduct of a Bidder or a Contractor or his subcontractor or of an employee or a representative or an associate of a Bidder or Contractor or his Subcontractor which constitutes corruption, or if ASCDCL has substantive suspicion in this regard, ASCDCL will inform the Chief Vigilance Officer (CVO).

### **(\* Section VIII - Independent External Monitor / Monitors**

1. ASCDCL has appointed a panel of Independent External Monitors (IEMs) for this Pact with the approval of Central Vigilance Commission (CVC), Government of India, out of which one of the IEMs has been indicated in the NIT/IFB.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

2. The IEM is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement. He has right of access to all project documentation. The IEM may examine any complaint received by him and submit a report to CEO, ASCDCL, at the earliest. He may also submit a report directly to the CVO and the CVC, in case of suspicion of serious irregularities attracting the provisions of the IPC Act. However, for ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter shall be referred to the full panel of IEMs, who would examine the records, conduct the investigations and submit report to CEO, ASCDCL, giving Joint findings.
3. The IEM is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CEO, ASCDCL.
4. The Bidder(s)/Contractor(s) accepts that the IEM has the right to access Without restriction to all documentation of ASCDCL related to this contract including that provided by the Contractor/Bidder. The Bidder/Contractor will also grant the IEM, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his documentation. The same is applicable to Subcontractors. The IEM is under contractual obligation to treat the information and documents of the Bidder( s)/ Contractor( s)/ Subcontractor( s) with confidentiality.
5. ASCDCL will provide to the IEM information as sought by him which could have an impact on the contractual relations between ASCDCL and the Bidder/Contractor related to this contract.
6. As soon as the IEM notices, or believes to notice, a violation of this agreement, he will so inform the CEO, ASCDCL and request the CEO, ASCDCL to discontinue or take corrective action, or to take other relevant action. The IEM can in this regard submit non-binding recommendations. Beyond this, the IEM has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the IEM shall give an opportunity to ASCDCL and the Bidder/Contractor, as deemed fit, to present its case before making its recommendations to ASCDCL.
7. The IEM will submit a written report to the CEO, ASCDCL within 8 to 10 weeks from the date of reference or intimation to him by ASCDCL and, should the occasion arise, submit proposals for correcting problematic situations.
8. If the IEM has reported to the CEO, ASCDCL, a substantiated suspicion of an offence under relevant Anti- Corruption Laws of India, and the CEO, ASCDCL has not, within the reasonable time taken visible action to proceed against such offence or reported it to the CVO, the Monitor may also transmit this Information directly to the CVC, Government of India.
9. The word '**IEM**' would include both singular and plural.



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Thus Section shall be applicable for only those packages wherein the IEMs have been Identified in Invitation for Bids and/or Bid Data Sheets of Conditions of Contract, or in any of the Bidding Documents.

### **Section IX - Pact Duration**

This Pact begins when both parties have legally signed it. It expires for the Contractor after the closure of the contract and for all other Bidder's six month after the contract has been awarded.

### **Section X - Other Provisions**

1. This agreement is subject to Indian Law Place of performance and jurisdiction is the establishment of ASCDCL. The Arbitration clause provided in the main tender document / contract shall not be applicable for any issue / dispute arising under Integrity Pact.
2. Changes and supplements as well as termination notices need to be made in writing.
3. If the Contractor is a partnership firm or a consortium or Joint Venture, this agreement must be signed by all partners, consortium members and Joint Venture partners.
4. Nothing in this agreement shall affect the rights of the parties available under the General Conditions of Contract (GCC) and Special Conditions of Contract (SCC)
5. Views expressed or suggestions/ submissions made by the parties and the recommendations of the CVO/IEM# in respect of the violation of this agreement, shall not be relied on or introduced as evidence in the arbitral or judicial proceedings (arising out of the arbitral proceedings) by the parties in connection with the disputes/ differences arising out of the subject contract. # CVO shall be applicable for packages to wherein IEM are not Identified in Section IFB/ Condition of Contract, IEM shall be applicable for packages wherein IEM are identified in Section IFB/Condition of Contract.
6. Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(Signature)

(For & On behalf of ASCDCL)  
Bidder/Contractor)

(Office Seal)

Name:

Designation

(Signature)

(For & On behalf of

(Office Seal)

Name:

Designation

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Witness 1:  
(Name & Address).

Witness 1:  
(Name & Address)

Witness 2:  
(Name & Address) .

Witness 2:  
(Name & Address)

**Annexure 14: Indenture for Secured Advances**

**FROM 31**

**(For use in cases in which the contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time.)**

This indenture made the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_ BETWEEN \_\_\_\_\_ (hereinafter called the contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) or the one part and the employer of the Other Part.

Whereas by an agreement dated \_\_\_\_\_ (hereinafter called the said agreement)

the contractor has agreed.

AND WHEREAS the contractor has applied to the Employer that he may be allowed advanced on the security of materials absolutely belonging to him and brought by him to the site of the works the subject of the said agreement for use in the construction of such of the works as he has undertaken to executive at rates fixed for the finished works (inclusive of the cost of materials and labour and other charges)

AND WHEREAS the Employer has agreed to advance to the Contractor the sum of Rupees on the security of materials the quantities and other particulars of which are detailed in Accounts of Secured Advances attached to the Running Account bill for the said works signed by the Contractor on and the Employer has reserved to himself the option of making any further advance or advance on the security of other materials brought by the Contractor to the site of the said works.

Now THIS INDENTURE WINTNESSE that in pursuance of the said agreement and in consideration of the sum of Rupees on or before the execution of these presents paid to the Contractor by the Employer (the receipt where of the Contractor doth hereby acknowledge) and of such further advance (if any) as may be made to him as a for said the Contractor doth hereby covenant and agree with the ASCDCL and declare as follows :

- (1) That the said sum of Rupees \_\_\_\_\_ so advanced by the Employer (means ASCDCL) to the Contractor as aforesaid and all or any further sum or sums advanced as aforesaid shall be employed by the Contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- (2) That the materials details in the said Account of Secured Advances which have been offered \_\_\_\_\_ to and accepted by the Employer as security are absolutely the Contractor's own propriety \_\_\_\_\_ and \_\_\_\_\_ free from encumbrances of any kind the contractor will not make any application for or receive \_\_\_\_\_ a \_\_\_\_\_ further advance of the security of materials which are not absolutely his own property and free from encumbrances of any kind and the contractor indemnified the -----, ASCDCL, Aurangabad against all claims to any materials in respect of which an advance has been made to him as aforesaid.
- (3) That the materials detailed in the said account of Secured Advance and all other materials \_\_\_\_\_ on the security of which any further advance or advance may hereafter be made as aforesaid (hereafter called the said materials) shall be used by the Contractor solely in the execution of the said works in accordance with the directions of the Engineer.
- (4) That the Contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe custody and protection against all risks of the said materials and \_\_\_\_\_ that \_\_\_\_\_ until \_\_\_\_\_ used \_\_\_\_\_ in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and on his own responsibility and shall at all times be open to inspection \_\_\_\_\_ by the Engineer or any officer authorised by him. In the event of the said materials or any part \_\_\_\_\_ thereof being stolen, destroyed or damaged or becoming deteriorated in a greater degree than is \_\_\_\_\_ due \_\_\_\_\_ to reasonable use and wear thereof the Contractor will forthwith replace the same with other \_\_\_\_\_ materials of like quality or repair and make good the same required by the Engineer/ASCDCL.
- (5) That the said materials shall not be any account be removed from the site of the said works except with the written permission of the Engineer or an officer authorized by him on that behalf
- (6) That the advance shall the -----ASCDCL, Aurangabad of the price payable in full when or before the Contractor receives payment from the ----- ----ASCDCL, Aurangabad of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payment are made to the Contractor on account of work done than on the occasion of each such

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

payment the Employer will be at liberty to make a recovery from the contractor's bill for such payment by deducting there from the value of the said materials than actually used in the construction and in respect of which recovery has not been made previously, the value for this purpose being determined in respect of each description of materials at the rates at which the amounts of the advances made under these presents were calculated.

- (7) That if the Contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing of the -----, ASCDCL, Aurangabad shall immediately on the happening of such default be repayable by the Contractor to be the Employer together with interest thereon at twelve percent per annum from the date or respective dates of such advance or advances to the date of repayment and with all costs, charges, damages and expenses incurred by the -----ASCDCL, Aurangabad in or for the recovery thereof or the enforcement of this security or otherwise by reason of the default of the Contractor and the Contractor hereby covenants and agrees with the ----- ASCDCL, Aurangabad to reply and pay the same respectively to him accordingly.
- (8) That the contractor hereby charges all the said materials with the repayment to the Employer of the said sum of Rupees and any further sum or sums advanced as aforesaid and all costs, charges, damages and expenses payable under these presents PROVIDED ALWAYS and it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the power contained therein if and whenever the covenant for payment and repayment here-in-before contained shall become enforceable and the money owing shall not be paid in accordance there with the ----- ASCDCL, Aurangabad may at any time thereafter adopt all or any of the following courses as he may deem best :
- (a) Seize and utilise the said materials or any part thereof in the completion of the said Works on behalf of the contractor in accordance with the provisions in that behalf contained in the said agreement debiting the contractor with the actual cost of effecting such completion and the amount due to the contractor with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the contractor, he is to pay same to the -----, ASCDCL, Aurangabad on demand.
- (b) Remove and sell by public auction the seized materials or any part thereof and out of the moneys arising from the sale retain all the sums aforesaid repayable or payable to the -----, ASCDCL, Aurangabad under these presents and pay over the surplus (if any) to the Contractor.
- (c) Deduct all or any part of the moneys owing out of the security deposit or any sum due to the Contractor under the said advance shall not be payable.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- (9) That except in the event of such default on the part of the contractor as aforesaid interest on the said advance shall not be payable.
- (10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents the settlement of which has not been here-in-before expressly provided for the same shall be referred to the Employer whose decision shall be final and the provision of the Indian Arbitration Act for the time being in force shall apply to any such reference.

**SPECIAL CONDITIONS OF CONTRACT**

**1. DEFINITIONS:**

In the contract, the following terms shall be interpreted as indicated.

- a. **"The Contract"** means the agreement entered into between the owner (ASCDCL) and the contractor as recorded in the contract form signed by the parties, and includes all the attachments and appendices thereto and all documents incorporated by references therein.
- b. **"The Contract Price"** means the price payable to the contractor under the contract for the full and proper performance of its contractual obligations.
- c. **"The Owner" and "Employer"** means the CEO, ASCDCL, for the time being holding that Office and also his successors and shall include any other officer authorized by him.
- d. **"The Department"** means ASCDCL of Aurangabad.
- e. **"The Contractor"** means successful tenderer, whose tender is accepted and who has been authorized to proceed with the work.
- f. **"ASCDCL"** means Aurangabad Smart City Development Corporation Limited.
- g. **"CEO"** shall mean Chief Executive Officer, Aurangabad Smart City Development Corporation Limited, Aurangabad, the person, for the time being holding that Office and also his successors and shall include any Engineer authorized by him.
- h. **"The Chief Engineer "** shall mean Chief Engineer of ASCDCL, the person, for the time being holding that Office and also his successors and shall include any Engineer authorized by him.
- i. **"Tender"** means the proposal of the contractor submitted in prescribed form setting forth the prices for the goods to be supplied and other related services to be rendered and setting forth his acceptance of the terms and obligations of the conditions of contract and specifications.
- j. **"Contract Time"** means period specified in the document for the entire execution of contracted works and other services to be rendered commencing from the date of notification of award including monsoon period.
- k. **"Month"** means the calendar month.
- l. **"Site"** means location at which the contractor will have to execute the contracted work.
- m. **"The Engineer or Engineer-in-charge"** shall mean the Engineer authorized by the CEO, ASCDCL, Aurangabad.
- n. **"Consultant"** means Consultant appointed by the CEO, ASCDCL, Aurangabad.
- o. **"City Engineer"** means city engineer of ASCDCL, Aurangabad or any other engineer authorized by CEO, ASCDCL.

**SPECIAL CONDITIONS**

- 1.1 The contractor shall erect temporary sheds for storage for materials brought by him on site. The contractor shall have separate godowns for storage of cement and other materials.
- 1.2 Major materials i.e. cement, and steel, brought on the work site shall be accompanied with the necessary company/manufacturing firm's test certificates. In addition, these materials shall be tested as per frequency prescribed by the Department and the cost of such testing shall be borne by the contractor. If the test results are satisfactory, then only the material shall be allowed to be used on the work. If the test results are not as per standards, these materials shall be immediately removed from the work site at contractor's cost. In case of cement, if so requested by the contractor in writing, material will be allowed to be used before receipt of test results but this will be entirely at the risk and cost of the contractor.
- 1.3 The contractor shall maintain register of major materials as directed by Engineer in Charge. The proforma as specified in PWD accounts code "Material at site account" shall be used. These registers shall be signed by both contractors and representative of Engineer-in-Charge. These registers shall be made available for inspection, verification for the Department as and when required.
- 1.4 Contractor shall have Cube Testing machine on site. Test cubes shall be tested in front of Engineer-in-Charge or his representative and a register for it shall also be maintained. 30% samples shall be sent to outside labs approved by the Engineer in Charge.
- 1.5 All the formwork used for construction shall be of steel or with lining of steel. Wooden shutters, in general, shall not be allowed except in case of minor components at the discretion of the CEO.
- 1.6 All the water pumping arrangements shall be made and temporary structures/diversions constructed by the contractor, if required during carrying out the works, at his cost and nothing extra shall be paid on this account.
- 1.7 Contractor shall take trial pits and trial bores at site at his own cost to ascertain the bearing capacity of the strata and accordingly submit the designs. The Contractor shall maintain the record of these details in prescribed proforma and registers as directed by the CEO, ASCDCL.
- 1.8 Contractor shall take photographs and videos of all sub-works during construction on monthly basis and submit two copies in hard and soft copies to ASCDCL.

**2. SCOPE AND MEANING OF CONTRACT:**

The term contract hereinafter used means and includes the notice for invitation of tender, tender document issued to the contractor, rates quoted by the contractor and accepted by ASCDCL, and drawings. These are subject to any alterations, modifications and negotiations carried out and agreed to before the contract is finally decided and accepted by the CEO, ASCDCL. The term contractor and firms mean the agency entering into contract with the CEO.

- 2.1 The scope of work includes-
  - 2.1.1 The work is intended to provide Construction of Smart City Bus Depot at Mukundwadi, Aurangabad including Civil Work-RCC Work, Brick Work, Plastering,



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Flooring, Colouring etc, Electrical Work, VAC Work, Fire Fighting work. Drawings will be issued by the Engineer in Charge to carry out the work.

2.1.2 Above scope is for general guidelines though work shall be carried out as per the drawings only.

2.2 The mix designs, getting them approved from government engineering college, providing all material, labour, equipment, construction, testing and commissioning along with removing any observed defects during the defect liability period is in the scope of this work. The contractor will get the mix design done at his cost from the lab(s) approved by the Engineer in Charge.

### **3. ACQUAINTANCE WITH WORKS AND SITE CONDITIONS:**

The contractor shall be deemed to have carefully examined the scope of work, location and alignment of various components under this tender, site conditions, the general conditions, the specifications, drawings, availability of material required, etc., and has fully acquainted himself regarding all aspects of works.

### **4. OBSTRUCTIONS IN THE WORK:**

All obstructions such as electric cables, telephone line, water and sewer mains, manholes, natural drainage, culverts, storm water drains etc. coming in the way shall be carefully looked after against any damages which otherwise will have to be made good by the contractor at his own cost. Any work of removing, repairing or remaking etc. will be carried out by the contractor without any extra claims for the same in consultation with the respective departments.

### **5. LAND FOR THE USE BY THE CONTRACTOR FOR STORING MATERIALS ETC.:**

As far as possible the contractor shall be allowed to use the Land available with ASCDCL at site without any charge, in possession of ASCDCL for stacking his materials, stores, erection of temporary structures, sheds etc. with prior written permission of CEO. The location of the temporary structures to be erected shall be got approved from the CEO and all the materials and equipments required for the work shall be stacked at suitable place as directed by Engineer in charge. All of such land occupied by the contractor for temporary use shall be handed over back in good conditions to the entire satisfaction of the ASCDCL as and when demanded by him/her. Any damage or alterations made in the area shall be made good by the contractor. If the Departmental land is not available, the contractor has to make his own arrangements of land on hire or otherwise at his own cost.

### **6. LABOUR CAMPS:**

The contractor shall at his own expenses make all necessary provisions for land, housing, water supply and sanitary arrangements etc. for his employees and labour. He shall pay direct to the authorized concerned all rents, taxes and other charges as applicable. The contractor shall also comply with all requirements of health department in regard to maintenance of anti-epidemic conditions.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

The contractor at his cost shall make all arrangements for prevention of Coronavirus (Covid 19) as per the guidelines of the Government.

### **7. WORK THROUGH OTHER AGENCY IN THE SAME AREA:**

The CEO, ASCDCL shall have the right to execute the works, not included in this contract, but within the premises occupied by the contractor for the purpose of this contract, through any other agency.

### **8. SPECIFICATIONS:**

The wording of items in Schedule 'B' shall be taken as guidelines for general provisions and coverage under the item. The detailed specifications for relevant items shall be as per detailed specifications enclosed and as per P.W.D. Hand Book, Standard Specifications, Relevant and latest editions of IS. Code. The other standard, wherever quoted, shall be applicable. If the standard specifications fall short for the items quoted in the Schedule of this contract, reference shall be made to the latest Indian Standard Specifications/IRC codes. If any of the items of the contract do not fall in reference quoted above, the decision and specification as directed by the CEO shall be final.

It is presumed that the Contractor has gone carefully through the standard specifications and their amendments (Vol. I & II, 1981 edition) and the Schedule of rate of the Division and has also studied site conditions before arriving at rates quoted by him. The special provisions and detailed specification of wording of any item of Schedule B shall gain precedence over the corresponding contrary provisions (if any) in the standard specifications given without reproduction the details in contract. Decision of engineer in Charge/CEO shall be final in case of interpretation of specifications.

The precedence of the interpretation will be as given below;

1. Nomenclature of the item in Schedule – B
2. Special conditions/Technical specifications/Additional conditions attached in the tender
3. Maharashtra PWD Specifications
4. IS Codes
5. CPWD Specifications

### **9. WATER AND ELECTRICITY:**

The contractor shall make his own arrangements at his own cost for water required for construction, drinking and for labour camp. ASCDCL, Aurangabad does not take any responsibility for supply of water to contractor for construction or curing purposes during the entire work. If water is supplied by ASCDCL, Contractor shall take connection at his cost and provide water meter on it. Water charges shall be paid by the contractor as per prevailing water rates to the ASCDCL regularly every month. Power supply from MSEDCL if required for construction of work as well as for labour camp will have to be arranged by the contractor at his cost. ASCDCL does not take guarantee for continuous power supply at site.

### **10. LINE OUT:**

The contractor shall himself carry out the line out of works in the presence of the representative of ASCDCL and the contractor shall be responsible for accuracy of it. He shall employ a qualified Engineer for this purpose as well as for supervision of works.

**11. PROGRAMME AND PROGRESS SCHEDULE:**

The contractor shall furnish within 15 days from the date of work order/LOA a progress schedule indicating the date of start, monthly/quarterly progress expected to be achieved as per the directions of Engineer in Charge and anticipated date of completion of each major item of the work. The schedule should be capable of achievement towards completion of whole work in the stipulated time.

i. The Contractor shall submit his own programme as per time limit stipulated in the tender, in the form of PERT/Bar Chart which should give details of milestones of physical stages of each sub work. Simultaneously with the execution of the Contract Agreement, the Contractor shall submit to The Engineer his item-wise monthly programme, which shall be nothing but detailing of the programme,

ii. The programme shall also state the milestones of part commissioning and part completion of the sub-work included in the tender. The programme shall also provide the information as to required approvals to drawings, samples, materials, equipment's and their time of submissions to Engineer in Charge. The progress shall be submitted by the Contractor vis-a-vis programme every month. The works team of the Contractor shall be so motivated to know the balance work at the end of each week and the rate required in the balance period to complete the work and therefore, shall endeavour to complete the task assigned for each week timely. In case, where the updated and revised schedule is required, the same shall be submitted to the Engineer/owner for approval.

In the event of contractor failing to execute the work as per scheduled programme submitted by him or in the event of unreasonable delay in the part of contractor, he shall be liable to as compensation an amount at the fixed rate subject to maximum amounting to 10% of the tender cost.

**12. CHECKING QUALITY OF THE WORK:**

The Engineer-in-Charge to ensure quality of work, may consider it necessary to satisfy himself through inspections, and testing of materials. The contractor shall at any time during continuance of the contract period produce samples of work done or if necessary, pull down a defective part of the work as decided by Engineer in Charge after inspection and/or testing as the Engineer-in-Charge may direct. The contractor shall make good the same at his cost and to the satisfaction of the Engineer-in-Charge without extra cost.

**13. CHANGES:**

Any marginal and minor changes as may be found necessary by the Engineer-in-Charge during execution shall have to be carried out by the contractor without extra cost.

**14. INSURANCE OF WORKERS:**

The successful tenderer shall get the labour insurance and as per Clause 61, done on account of risk involved, within a month from the date of work order, failing which 1% of the Contract Value shall be withheld from the R.A. bills of the work and it shall not be refunded till labour insurance is done and a documentary Evidence to this effect is produced by the contractor. The successful contractor tenderer shall purchase insurance policy indemnifying the CEO therein as per the directions of Engineer in Charge. In case, the completion period is extended, then the period of insurance shall be renewed/extended as per requirement.

**15. ARBITRATION:**

The procedure for arbitration will be as per G.R of Law & Judiciary Department issued vide Sankirn- 2016/C.R. 20/ Ka-19 dt.13/10/2016 regarding “Institutional Arbitration Policy”, including amendments if any.

**16. INTENT AND INTERPRETATION OF CONTRACT DOCUMENTS:**

The contract documents are complementary and what is called for by one is as binding as if called for by all. Any work that may be reasonably inferred from the drawings or specifications as being required to produce the intended result shall be provided by the contractor whether or not it is specifically called for, in Schedule- 'B'.

The contractor shall furnish and pay for all labour, supervision, materials, equipment, transportation, construction, equipment and machinery tools, appliances, water, fuel, power, energy, light, heat, utilities, telephone, storage, protections, safety provisions, and all other facilities like service, incidentals, approaches to site etc. any nature whatsoever necessary for the satisfactory and acceptable execution, testing and completion of the work in accordance with the contract documents, ready for use and operation by the owner. The cost of all these arrangements shall be deemed to be included in the contract offer and no separate payment shall be admissible thereof.

Written clarifications or interpretations necessary for the proper execution or progress of the work, in the form of drawings or otherwise, will be issued with reasonable promptness by the Engineer and in accordance with any schedule agreed upon.

Figured dimensions on drawings shall govern over scaled dimensions and detailed drawings shall govern over general drawings.

Signed drawings alone shall not be deemed to be in order for work unless it is entered in the agreement or schedule or drawings under proper attestation of the Contractor and the Engineer or unless it has been sent to the contractor by the Engineer with a covering letter confirming that the drawing is an authority for work in the contract.

Work, materials or equipment described in words which so applied have a well-known trade or technical meaning shall be deemed to refer to such recognized meanings.

**17. LAND, CONDITION AND LAYOUT:**

**17.1 Surveys and Measurements**

The contractor shall carefully preserve all surveys as also setting out stakes, reference points, benchmarks and monuments. If any stakes, points or benches be removed or destroyed by any act of the contractor or his employees, they may be reset at the contractor's expense. The contractor shall supply without charge the requisite number of persons with the means and materials necessary for the purpose of surveying, setting out works, and counting, weighing and assisting in the measurement or examination of the work/materials at any time as required by the Engineer in Charge.

The Contractor will establish at the work site a substantial B.M. and connect it to a permanent B.M. available in the area with known value. The contractor will then carry out necessary surveys and levelling, covering his work, in verification of the survey data on the working drawings furnished by the Engineer and he will be responsible for establishing the correct lines and levels and verification of the lines and level furnished on the working drawings. If any error has occurred in the work due to non-observance of this clause, the contractor will be responsible for the error and bear the cost of corrective work.

**17.2 Site Office**

The Contractor shall construct at his cost a semi-permanent nature site office with minimum of 20 Sq. m area and shall provide minimum two tables, two almirahs, six numbers of chairs. The office and the furniture shall be provided and maintained by the contractor throughout the contract period at his cost. The use of the site offices shall be adequate size to accommodate the inspecting Engineers of PMC/Supervisory agency/Consultant/Owner/any other inspection committee/agency appointed by the Government of India/Maharashtra/ Collector/ Municipal Administration/ASCDCL to discuss and review progress of work. No extra payment will be made on this account.

**18. SECURITY DEPOSIT AND INDEMNITY BOND:**

The security deposit shall be returned to the contractor without any interest when the contractor ceases to be under any obligation under the contract. This shall be read with Clause No.1 and 20 of B-1 Form for Security Deposit and Defect Liability Clause respectively.

The contractor shall be responsible during the progress as well as maintenance for any liability imposed by law for any damage to the work or any part thereof or to any of the materials or other things used in performing the work or for injury to any person or persons or for any property damaged in or outside the work limit. The contractor shall indemnify and hold the owner and the Engineer harmless against any and all liability, claims, loss or injury, including costs, expenses, and attorney's fees incurred in the defence of same, arising from any allegation, whether groundless or not, of damage or injury to any person or property resulting from the performance of the work or from any material used in the work or from any condition of the work or

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work site, or from any cause whatsoever during the progress and maintenance of the work.

The contractor shall have experienced in similar work, technically qualified engineer and supervisor for the work, capable of managing and guiding the work and also capable of understanding the instructions given to them by the Engineer-in-Charge from time to time and shall be responsible to carry them out promptly. The contractor shall have during working hours, supervisor of sufficient training and experience to supervise the various items and operations of the work. Further, the Engineer-in-Charge may notice, desire contractor high ranking member to be present on any specified date, the contractor shall comply with such directions

The contractor shall supervise and direct the works efficiently and with his best skill and attention. He shall be solely responsible for means, methods, techniques, procedures and sequences of construction. The contractor shall co-ordinate all parts of the work and shall be responsible to see that the finished work complies fully with the contract documents, and such instructions and variation orders as the Engineer may issue during the progress of the works.

### **18.1 Site Engineer**

The Contractor shall keep on the work at all times during its progress competent engineer(s), qualified and experienced, capable of managing and guiding the work and understanding the specifications and contract conditions. For this purpose, the contractor shall communicate to the Department, name, qualification and experience of such Engineer(s) to be appointed for execution of this work as per the tender documents. They shall not be replaced without ten (10) days written notice to the Engineer except under extra-ordinary circumstances. The engineer shall be the Contractor's representative at the site and shall have authority to act on behalf of the contractor. All communications, instructions and directions given to the agent shall be binding as if given to the Contractor by the Engineer not otherwise required to be in writing will be given or confirmed in writing upon request of the Contractor or in work-order (site order) book.

### **18.2 Care and Use of Site**

The Contractor shall not commence operations other than the work on land allotted for work without prior approval of the Engineer. If the land is not adequate the Contractor's establishment required for the work, he may have to make his own arrangements for additional land(s) required for his use. The contractor shall not demolish, remove or alter any of the structures, trees or other facilities on the site without prior approval of the Engineer. All the area of Contractor's operations shall be cleared before returning them to the Engineer.

### **19. OVERLOADING:**

No part of the work or new and existing structures, scaffolding, shoring, sheeting, construction machinery and equipment, or other permanent and temporary facilities shall be loaded more than its capacity. The Contractor shall bear the cost of correcting damage caused by loading or abnormal stresses or pressures.

**20. MANUFACTURER'S INSTRUCTIONS:**

The Contractor shall compare the requirements of the various manufacturer's instructions with requirements of the contract documents, shall promptly notify to the Engineer in writing of any difference between such requirements and shall not proceed with any of the works affected by such difference until an interpretation or clarification is issued pursuant to it.

The contractor shall bear all costs for any error in the work resulting from his failure to the various requirements and notify the owner/ASCDCL of any such difference.

**21. PROTECTION:**

The contractor shall take all precautions and furnish and maintain protection to prevent damage, injury or loss to other persons who may be affected thereby. All the works and all materials and equipment to be incorporated therein whether in storage or on the site, under the care, custody or control of the contractor or any of his sub-contractors and other improvements and property at the site or where work is to be performed including building, tools and plants, pole lines, fences, guard rails, guide posts, culvert and works markers, sign structures, conduits, pipelines and improvements within or adjacent to streets, right-of-way, or easements, except those items required to be removed by the Contractor as per the contract documents. The Contractors protection shall include all the safety precautions and other necessary forms of protection, and the notification of the owners of utilities and adjacent property.

The contractor shall protect adjoining site against structural, decorative and other damages that could be caused by the execution of works and make good at his cost any such damages that could be caused by the execution of works and make good at his cost any such damages.

**21.1 UTILITIES AND SUB-STRUCTURES:**

Before commencing any excavations, the Contractor shall investigate, determine the actual locations, and protect the indicated utilities and structures, shall determine the existence, position and ownership of other utilities and substructures in the site or before the work is performed by communication with such property owners, search of records, or otherwise and shall protect all such utilities and substructures.

Except for those improvements and facilities required to be permanently removed by the contractor, the contractor shall make satisfactory and acceptable arrangements with the appropriate owners, and shall repair, restore all improvements, structures, private and public roads, property, utilities and facilities disturbed, disconnected, or damaged as a result or consequence of his work or the operations of those for whom he is responsible or liable, including that caused by trespass of any of them, with or without his knowledge or consent, or by the transporting of workmen, material or equipment to or from the site.

**22. WORKMEN AND WORKMANSHIP:**

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The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the works any unfit person or anyone not healthy, skilled and experienced in the assigned task. The Contractor shall in respect of labour employed by him comply with or cause to be complied with the provisions of various labour law and rules and regulations as applicable to them in regard to all matters provided therein and shall indemnify the owner in respect of all claims that may be made against the owner for non-compliance thereof by the Contractor.

In the event of the contractor committing a default or breach of any provisions of labour laws and rules and regulations, the Contractor shall without prejudice to any other liability under the acts pay the owner/ASCDCL a sum as decided by the engineer.

Unless otherwise provided, none of the permanent works shall be carried out during night, Sunday or authorized holidays without permission in writing. However, when work is unavoidable or necessary for the safety of life, priority of works, the Contractor shall take necessary action immediately and intimate the Engineer accordingly.

The quality of workmanship produced by skilled knowledgeable and experienced workmen, machines and artisans shall be excellent. Particular attention shall be given to the strength, appearance and finish of the work.

### **23. MATERIALS AND EQUIPMENT:**

All materials and equipment incorporated in the work shall be new. Materials and equipment not covered by detailed requirements in the contract documents shall be of the best commercial quality suitable for the purpose intended and approved by the owner/ASCDCL prior to use in the work.

Only one brand, kind or make of material or equipment shall be used for each specific purpose through-out the works, notwithstanding that similar material or equipment of two or more manufacturers or proprietary items may be specified for the same purpose as per the directions of the Engineer in Charge.

### **24. USE OF APPROVED SUBSTITUTIONS OR EQUALS, EXTRA ITEMS AND SUBSTITUTED ITEMS:**

The contractor shall bear all extra expenses resulting from providing or using approved substitutions of higher specifications or equals in case the contractor desires so, including the expenses of required engineering, redesigning, drafting and permits where necessary, on written Engineer's approval only.

In the case of Extra Item(s) being the schedule items (State Schedule of Rates 2020-21, PWD, Government of Maharashtra for civil and Current Schedule of Rates (Electrical) 2018-19, PWD, Government of Maharashtra, for electrical items), these shall be paid as per the schedule rate plus/minus percentage above/ below quoted contract amount. Payment of Extra items in case of non-schedule items (Non-State



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Schedule of Rates 2019-20, PWD, GoM items for civil and Non Current Schedule of Rates, PWD, GoM 2018-19 for electrical items) shall be made as per the prevailing market rates, subject to the rate analysis.

In the case of Substitute Item(s) being the schedule items (State Schedule of Rates 2019-20, PWD, Government of Maharashtra items), these shall be paid as per the schedule rate plus/minus percentage above/ below quoted contract amount. Payment of Substitute in case of non-Schedule items (Non-State Schedule of Rates 2019-20 items for civil and Non Current Schedule of Rates, PWD, GoM 2018-19 for electrical items) shall be made as per the prevailing market rate, subject to the rate analysis.

### **25. LAWS AND REGULATIONS:**

#### **25.1 Governing Law**

The contract documents shall be governed by the laws and by-laws of India, the State of Maharashtra and the local bodies in this region.

#### **25.2 Resolving the disputes**

Save where expressly stated otherwise in this Agreement, any dispute, difference or controversy of whatever nature howsoever arising under, out of or in relation to this Agreement including non compliance of the Agreement between the Parties and so notified in writing by either Party to the other (the "Dispute") in the first instance shall be attempted to be resolved amicably by the Parties and failing such resolution of the same, in accordance with the procedure set forth below.

Either Party may require the Dispute to be referred to the CEO, ASCDCL for amicable settlement. Upon such reference, both the Parties shall meet at the earliest mutual convenience and in any event within 15(fifteen) days of such reference to discuss and attempt to amicably resolve the dispute. If the Dispute is not amicably resolved within 15(fifteen) days of such meeting, either Party may refer the Dispute to arbitration in accordance with the provisions of Arbitration clause.

### **26. BURIED AND CONCEALED WORK:**

The contractor shall help in recording the precise location of all piping, conduits, ducts cables and like work that is buried, embedded in concrete or masonry, or concealed in wood or metal frame walls and structures at the time such work is installed and prior to concealment. Should the contractor cover such buried or work before such recording takes place, he shall uncover the unrecorded work to the extent required by the Engineer and shall satisfactorily restore and reconstruct the removed work with no change in the contract price or the contract time.

### **27. SAFETY PRECAUTIONS AND EMERGENCIES CONTRACTOR'S RESPONSIBILITY FOR SAFETY:**

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The contractor shall be solely responsible notwithstanding any stipulations by owner or Engineer for initiating, maintaining and supervising all safety precautions and programme, in connection with the work and shall comply with all laws, ordinance, code rules regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damages, injury or loss during the entire contract period including extensions and non-working hours before completion of work.

On the occurrence of an accident arising out of the works which result in death or which is so serious as to be likely to result in death, the contractor shall within one hour of such accident intimate in writing to the Engineer and the authorities concerned, the facts stating clearly and with sufficient details the circumstances of such accidents and subsequent action taken by him. All other accidents on the works involving injuries to the persons or property other than that of the contractor shall be promptly reported to the Engineer clearly and with sufficient details the facts of such accidents and the action taken by the contractor. In all cases, the contractor shall indemnify the Engineer against all losses or damages, resulting directly from the contractor's failure to report in the manner aforesaid.

This includes the penalties or fines, if any payable by the owner as a consequence of failure to give notice under Workmen's Compensation Act or otherwise to conform to the provisions of the said Act in regard to such accidents. In the event of an accident in respect of which compensation may become payable by the contractor, such sum of money as may, in the opinion of the Engineer/concerned authorities shall be payable and be sufficient to meet such liability will be kept in deposit by the Engineer. On the receipt of award from the Labour chief officer in regard to the quantum of compensation, the difference in the amount will be adjusted from the contractor

It is obligatory that the contractor shall take an all Risk Insurance Policy for the works and keep it in force throughout the work period.

### **28. WARNINGS AND BARRICADES:**

The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sunrise and all other necessary appliances and safeguards to protect the work, life, property, the public, excavations, equipment and materials. Barricades shall be substantial construction and shall be painted such as to increase their visibility at night. For any accident arising out of the neglect of above instructions, the contractor shall be bound to bear the expenses of defence of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

### **29. ENGINEER'S STATUS DURING CONSTRUCTION, AUTHORITY OF THE ENGINEER:**

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The Engineer shall have the authority to enforce compliance with the contract documents. On all questions relating to quantities, the acceptability of materials, equipment, or works, the adequacy of the performance of the work and the interpretation of the drawings and specifications, the decision of the Engineer shall be final and binding and shall be precedent to any payment under the contract agreement unless otherwise provided in the contract documents. The Engineer shall have the authority to stop the work or any part thereof as may be necessary to ensure the proper execution of the work, disapprove or reject the works which is defective, to require the uncovering and inspection or testing of the works to require re-examination of the works, to issue interpretations and clarifications, to order changes or alterations in the works, and other authority as provided elsewhere in the contract documents.

The Engineer shall not be liable for the results of any ruling, interpretation or decision rendered, or request, demand, instruction, or order issued by him in good faith. The contractor shall promptly comply with requests, demands, instructions and order from the Engineer.

The whole of the works shall be under the directions of the Engineer, whose decision shall be final, conclusive and binding on all parties to the contract, on all questions relating to the construction and meaning of plans, working drawings, sections and specifications connected with the work. The Engineer shall have the power and authority from time to time and at all times make an issue 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 the terms of specifications and the contractor shall receive, execute, obey and be bound by the same according to the true intent and meaning thereof, fully and effectually.

Engineer 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 works or any portion of works executed or partially executed, to be removed, changed or altered and if needful, may order that other works shall be substituted instead thereof and the difference of expenses occasioned by any such diminution or alteration so ordered and directed shall be deducted from or added to the amount of this contract.

### **30. DUTIES OF ENGINEER'S REPRESENTATIVE:**

The duties of the representative of the Engineer are to check, inspect and continuously supervise the work and to test any materials to be used or workmanship employed in connection with the works. He shall furnish the drawings and information to the contractor, approve the contractor's drawings subject to post-facto approval and signature of the Engineer-in-Charge, recommend and approve the interim certificates and taking over certificates after thorough checking and inspection and recommend extra work required and extension of time.

Approval for or acceptance of any work or material or failure to disapprove any work or material by the representative of the Engineer shall not prejudice the power of the Engineer thereafter to disapprove such work of material and to order removal or modification thereof. If the contractor shall be dissatisfied with any decision of the representative of the Engineer, he shall be entitled to refer the matter to the Engineer, who shall thereupon confirm, reserve or vary such decision only in genuine cases.

**31. DEFECTS AND RECTIFICATION:**

For period specified in the Clause 20 of B.1 form for the defect liability period for the individual type of work from the date of issuance of the completion certificate in accordance with Condition "Final Inspection and Acceptance" mentioned herein after, contractor shall remain liable for any of the works or parts thereof or equipment and fittings supplied which in the opinion of the Engineer fail to comply with the requirements of the contract or are in any way unsatisfactory or defective except fair wear and tear. All such materials/works shall be redone by the contractor without any extra costs.

To the intent that the works and each part thereof shall at or as soon practicable after the expiry of the above period be taken over by the Engineer in the condition required by the contract to the satisfaction of the Engineer, the contractor shall finish the work (if any) outstanding at the date of completion as soon as may be practicable after such date and shall execute all such work of repair, amendment, reconstruction, rectification and making good of defects imperfections, shrinkages or other faults as may during the period of maintenance or after its expiry be required of the contractor in writing by the Engineer as a result of an inspection made by or on behalf of the Engineer prior to the expiry of the period. The contractor at his own expenses shall carry out all such work if the necessity thereof shall in the opinion of the Engineer and due to the use of materials or to neglect or failure on the part of the contractor to comply with any obligation expressed or implied on the contractor's part under the contract. If the contractor fails to do any such work as entitled to carry out such work in which the contractor should have carried out at the contractor's own cost, the Engineer shall be entitled to recover from the contractor the cost thereof or may deduct the same from the moneys that become due to the contractor. Notwithstanding the aforesaid, if the contractor remains in default for one calendar month after the Engineer has given written instructions in writing, the amount required for removal of defects shall be recovered from the Security Deposit and the ASCDCL/Engineer will deduct the cost plus overhead expenses of such works as have been necessary to rectify the contractor's default and the balance, and balance if any, shall be disbursed. The Contractor shall submit the "As Built Drawings" and operation and maintenance manual for the fruitful operation of the works. The Contractor will have a liberty to visit the works during the defect liability period and satisfy himself about the on-going operations in case he does not visit and a defect is observed then the Engineer's opinion shall be final and binding as to the application of defect liability.

**32. RIGHT TO WITHHOLD:**

The Engineer may refuse to approve to any payment, or because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously approved and paid to such extent as may be necessary in the opinion of the Engineer to protect him from loss because (a). The work is defective, (b) Third party claims have been filed or there is reasonable evidence indicating probable filing of such claims, (c) of the Contractor's failure to make payment properly to sub-contractors or for labour, materials or equipment, (d) of damage to another Contractor, or to the property of other caused by the Contractor, (e) of

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reasonable doubt that the work cannot be completed for the unpaid balance of the contract price, (f) of reasonable indication that the work will not be completed within the contract time, (g) of the Contractor's neglect or unsatisfactory prosecution of the work including failure to clean up. Once the provisions of law that enables or require the Engineer to withhold such payments are removed, payment will be made for amounts withheld because of them to the extent the contractor is entitled to payment.

### **33. FINAL INSPECTION AND ACCEPTANCE:**

Upon written notice from the contractor, that the entire work required by the contract documents is complete and that all submittals required by him are made, and after the Contractor has delivered the bonds, certificates of inspection, guarantees, warranties, releases and other documents, as required by the contract documents or by law, the Engineer will make a final inspection, and he will notify the Contractor in writing of any particulars in which this inspection reveals that the work is defective, and will also notify the Contractor in writing of any deficiencies in the submittals and the document required from him.

The Contractor shall promptly make such corrections as are necessary to remedy all defects or deficiencies. After the Contractor has completed any such corrections to the satisfaction of the owner, the Engineer will issue a written completion certificate of the work and file any notice and completion required by law or otherwise.

### **34. CONTINUING OBLIGATION OF THE CONTRACTOR:**

The Contractor's obligation to perform and complete the work in accordance with the contract documents is and shall be absolute. Neither the observation during construction and final inspection of the work by the Engineer, nor any payment to the Contractor under the Contract documents, nor any use or occupancy of the work or any part thereof by the Engineer, nor any act of acceptance by the defective work by the Engineer shall constitute acceptance of work not in accordance with the contract documents.

### **35. TAXES TO BE DEDUCTED AT SOURCE:**

During the course of contract period the deduction of Income Tax, GST, Works contract tax or any other Central/State or local tax required to be deducted at source, will be made as per prevailing rules from the contractors' bills and will be remitted to the concerned Departments. If so, certificates for such deductions will be issued by the ASCDCL.

### **36. RECORDS AND MEASUREMENTS:**

The Engineer shall except or otherwise stated therein, determine by measurement the value in accordance with the contract of works done in accordance therewith.

All items having a financial value shall be entered in a measurement book, level book etc. as prescribed by the Engineer so that a complete record is obtained of all work performed under the contract.

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The Engineer or his authorized representative shall take measurements jointly with the Contractor or his authorized representative. Before taking measurement of any work the Engineer or the person deputed by him for the purpose shall give reasonable notice to the contractor. If the contractor fails to attend or send an authorized representative for measurement after such notice or fails to countersign or record the objection within a week from the date of measurement, then in any such event measurements will be taken by the Engineer, or by the person deputed by him shall be taken to be correct measurements of the works and shall be binding on the contractor.

There shall be absolutely no doubt regarding the measurements and hence the contractor shall first arrange the exact branding of the alignment length on site, and mark distinctly. All hidden measurements shall be measured by steel tape, on the exact section as marked previously and depth by the regular staff generally at an average interval of 30 m or suitable interval decided by Engineer-in-Charge.

In case of difference of opinion in the measured quantity and the payable quantity of any particular measurements, the contractor must know the Departmental practices developed as per the manuals and standard specifications.

The Contractor shall, without any extra charge, provide assistance with every appliance and other things necessary for measurements, such as levelling instruments (Auto setting), tapes, staffs, camera, paints, brushes and required labour.

Measurements shall be signed and dated by both the parties each day (for taking measurement) on the site on completion of measurements. The Contractor shall take up still colour photographs at intervals during the execution of works so that a history of development of the works is maintained.

The dated photographs, in two copies, shall be submitted to the Engineer-in-charge every time. No extra cost will be paid for this. This generation of record shall provide the used methodology of working and highlight the quality of material and workmanship. The cost of the said work shall be borne by the Contractor. It shall be the property of ASCDCL and shall not be used for campaigning, advertising without permission of the Aurangabad Smart City Development Corporation Limited.

### **37. WRITTEN NOTICE:**

Written notice shall be deemed to have been duly served or delivered in person to the individual or member of the firm or to an Engineer of the contractor for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice. The notice on the Fax Message/ E-Mail shall be deemed to have been duly served. The address given in the contractor's tender on which all notices, letters and other communications to the contractor shall be mailed or delivered, except that said address may be changed by the Contractor by notifying the owner in writing. This shall not preclude the service of any notice, letter or other communication upon the Contractor personally.

### **38. USE OF COMPLETED PORTIONS:**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

The owner shall have the right, upon written notice to the Contractor, to take possession or occupancy of, and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired but such taking possession or occupancy and use shall not be deemed to waive of any requirement of the contract documents or a waiver or acceptance of any work not completed in accordance with the contract documents.

### **39. CLEANING UP:**

The contractor shall at all times during the work keep the site and premises, adjoining property and public property free from accumulations of waste materials, rubbish, and other debris resulting from the works, and at the completion of the work shall remove all waste materials, rubbish and debris from and about the site and premises as well as all tools, construction equipment and machinery and surplus materials, and shall leave the site and premises, clean, tidy and ready for occupancy by the owner. The Contractor shall restore to their original condition those portions of the site not designated for alteration by the contract documents paved ways, parking areas and roadways disturbed by the construction shall be redone by filling the excavation, if any, by sand compacted material and bringing it to its original shape as directed and approved by the Engineer. No waste material shall be buried or disposed of on the owner's property unless so approved in writing by the Engineer-in-Charge. Before the Contractor applies for final inspection and acceptance of the work, all items of work shall be complete, ready to operate, and in a clean condition as determined by the Engineer.

### **40. OWNER'S RIGHT TO CLEAN UP:**

If the Contractor fails to satisfactorily clean up or if a dispute arises between the Contractor or in several Contractors as to their responsibility for cleaning up, the Engineer may clean up and charge the cost thereof to the Contractor for his failure, or to the several contractors as the Engineer shall determine to be just.

### **41. FOSSILS ETC.:**

All fossils, coins, articles of value of antiquity and structures or other remains or things of geological or archaeological interest discovered on the site shall be deemed to be the property of the owner and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing and shall immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out at the expenses of the Engineer's order as to the disposal of the same.

### **42. LABOUR RULES:**

If demanded by authorities, the contractor will have to produce to the satisfaction of the accepting authority, a valid and current license issued in his favour under the provision of Contract Labour (Regulation and Abolition) Act 1970, before starting the work, otherwise the Contractor shall have to face the further consequences. The contractor shall have to comply with the Apprentices Act 1961, and the rules and orders issued there under from time to time. If he fails to do so, his failure will be

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

breach of contract and the ASCDCL, may in his discretion, cancel the contract, the Contractor shall also be liable, for any pecuniary liability Arising on account of any violation of the provisions of this act, by him. Salient features of some major labour laws/ Acts applicable to establishment engaged will be as below.

- a. Workman compensation Act1923.
- b. Payment of Gratuity Act1972.
- c. Employees PF and miscellaneous provisions Act1952.
- d. Maternity Benefit Act1951.
- e. Contract Labour (Regulations and Abolition) Act1970.
- f. Minimum Wages Act1948.
- g. Payment of Wages Act 1936.
- h. Equal Remuneration Act 1979.
- i. Payment of Bonus Act 1965.
- j. Industrial Disputes Act 1947.
- k. Industrial Employment (Standing orders) Act1946.
- l. Trade Union Act1926.
- m. Child labour act1926.
- n. Interstate Migrant Workmen's (Regulation of Employment and Conditioned of Services) Act1979.
- o. The Building and other construction works (Regulation of employment and conditions of Services Act 1946 and the Cess Act of1996).
- p. Factories Act 1948.

All the relevant law and act will be applicable for this work.

### **43. STATUTORY INCREASE IN DUTIES, TAXES, ETC.:**

- (i) All the taxes and duties levied by the Central Govt., State Govt and by Local Bodies at the prevailing rates applicable on the date of receipt of tender except GST shall be inclusive in the rates quoted by the tenderers. The contractors shall quote their rates considering the same.
- (ii) All tendered rates shall be inclusive of any tax, levy or cess applicable except GST on last stipulated date of receipt of tender including extension if any. However, effect of variation in rates of Building and Other Construction Workers Welfare Cess or imposition or repeal of any other tax, levy or cess applicable on output of the works contract shall be adjusted on either side, increase or decrease.  
Provided further that for Building and Other Construction Workers Welfare Cess or any tax (other than GST), levy or cess varied or imposed after the last date of receipt of tender including extension if any, any increase shall be reimbursed to the contractor only if the contractor necessarily and properly pays such increased amount of taxes/levies/cess.
- (iii) Provided further that such increase including GST shall not be made in the extended period of contract for which the contractor alone is responsible for delay as determined by authority for extension of time under Clause 6 of Clauses of Contract.



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the Government and/or the Engineer-in-Charge and shall also furnish such other information/document as the Engineer-in-Charge may require from time to time.

- (iv) The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

### **44. INSPECTION, TESTING & FEES:**

All material & equipment, irrespective whether specified or not, shall be tested at manufacturer's works laboratory/site/as decided by the Engineer in Charge and the Test Certificates thereof shall be furnished.

The test shall be witnessed by the Engineer-in-charge as well as the third party designated by the ASCDCL, if any. All inspection and testing related costs shall be borne by the contractor.

### **45. MACHINERY REQUIRED:**

All machinery required for erection/execution purposes such as concrete batch mix plant, concrete pumps, cranes, trucks, etc. shall be arranged by the Contractor. Department shall not take any responsibility for providing such machinery even on rental basis. No concreting shall be permitted unless centering/shuttering, concreting and reinforcement are approved by the Engineer-in-Charge.

### **46. WORK ORDER/SITE ORDER BOOK:**

A well bound work order/site order book shall be maintained on site and it shall be the property of the ASCDCL and the Contractor/ his engineer/agent shall promptly sign orders given therein by the Engineer in Charge /ASCDCL officials or his superior officer, in token of having received them and comply them. This will be a permanent record the compliance shall be reported by the contractor to the Engineer in good time so that it can be checked. The blank work order/site order book with machine numbered pages will be provided by the Engineer in Charge free of charge for this purpose. The Contractor will be allowed to copy out the instruction therein from time to time. He will not record any remarks in the order book but may take up the matter recorded therein.

### **47. DISCREPANCIES AND OMISSIONS:**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

The tender drawings and specifications, shall be considered as explanatory, of each other and together shall form the technical requirements and stipulations of tender documents. Detailed drawings shall have preference over small scale drawings. Similarly, detailed specifications shall have preference over general specifications. Should any discrepancy arise as to the meaning, intent or interpretation of any specification or drawing the decision of the Engineer- in-charge shall be final and binding on the Contractor.

### **48. PRICE VARIATION:**

Price variation is not applicable to this tender.

### **49. NO INTEREST ON DUES:**

No interest shall be payable by the ASCDCL on amounts due to contractors pending final settlement of claim. Further, no interest shall be payable by the ASCDCL on any amount/payment.

Any recovery advised by the ASCDCL shall be recovered from the bill(s) or money retained from this contract. All the recoveries either outstanding or dues under the contract or incidental there to as determined may be, stand recoverable.

Secured Advance will be granted as per provisions made in MPW Manual and MPW Account Code. The contractor will have to sign indenture as per Annexure 14.

### **50. MOBILIZATION ADVANCE:**

No mobilization advance for this work shall be granted.

## **ADDITIONAL CONDITIONS OF CONTRACT**

### **1. GENERAL**

The quoted rate shall be total rate for the completed item of work as per the item/specifications, and shall be inclusive of all incidental charges such as lifts, leads for materials, water for construction etc. unless otherwise mentioned in the item. The rates for excavation are inclusive of the edge of the excavation pit beyond foundation.

### **2. OUTLINE OF WORKS**

The work will be on the lines of plans/drawings attached to the tender documents. The plans/drawings are however, liable to change and strata as shown there is approximate.

The item of work and their approximate quantities are given in Schedule 'B' of the tender. The quantities are approximate and are liable to vary on plus or minus side.

### **3. UNITS**

The rates quoted for each item are for units mentioned in Schedule 'B' against each item.

### **4. SITE CONDITIONS**

- a. It shall be presumed that the Contractor has satisfied himself as to the nature of the works, general and local conditions, particularly on those bearings on transport handling, storage of materials, availability of labour, weather conditions and has estimated the cost and quoted his rates accordingly. The Engineer-in-charge /the ASCDCL will bear no responsibility for lack of such acquaintance with site conditions and consequences thereof.
- b. Set of tender documents and conditions (up to a maximum of two sets) at the discretion of the Engineer in charge /the ASCDCL will be supplied to the contractor after acceptance of tender.

### **5. LOCAL ROADS**

The information regarding existing public roads that are necessary to work and bring out materials shall be surveyed by the tenderer before submitting the tenders. In case, temporary road is required at the site to carry out the work, the contractor may construct and maintain the same as required at his own expenses.

### **6. CHANGE IN SITE CONDITIONS**

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No amount due to any claims shall be paid on account of reasonable change in site conditions, alignment or orientation of the proposed work, within the work site marked on plan/drawing attached to the tender as the circumstances may call for.

### **7. STRATA**

Strata for excavation are shown approximate based on trial pits and the Contractor shall have no right to claim extra if there are variations in the strata. The contractor will also have no claim if extra excavation is required to be done due to boulders and the Contractor will have to make such extra excavation good by filling the same by C.C. of minimum M-10 grade.

### **8. EXCAVATED MATERIALS**

All excavated stuff shall be the ASCDCL's property and shall be disposed off at lead and lift by the Contractor in a manner as directed by the Engineer in Charge. Contractor shall not sell or otherwise dispose of or remove except for the purpose of this contract, the rubble, stone metal, sand or other material which may be obtained from any excavation made for the purpose of the contract. All such materials shall be ASCDCL's property and shall be disposed of in the manner and at place as may be directed by the Engineer-in-charge. Contractor may with the permission of the Engineer- in-charge in writing and when directed by him, use any of the materials.

### **9. DAMAGES TO UNDER/ABOVE GROUND UTILITY**

During the course of excavation and carrying out the work, utmost care of existing mains, electrical and telephone cables and government/private water connections/sewage connections shall be taken. Any damage to such services occurs during the course of execution, same shall be restored by the contractor at his cost. In case the repairs are done by the owner/ASCDCL, the cost of such repair will be recovered from the contractor.

### **10. DAMAGE BY FLOODS OR ACCIDENT**

The Contractor shall take all precautions against damage by floods and from accidents. No compensation will be allowed to the contractor for his plant, material and work etc., lost or damaged by floods or from other causes. The Contractor shall be liable to make good any part of material which is in charge of the Contractor and which is lost or damaged by floods or from any other cause. If the work executed is damaged, trenches filled due to any reason, Contractor shall have to make it good at his cost only.

No claims for any desilting of trenches, foundation etc. filled due to floods, untimely rains, or any other reasons whatsoever shall be entertained and Contractor shall have to do this desilting operation together with dewatering operations entirely at his cost.

### **11. LEADS AND LIFTS**

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Unless otherwise specifically mentioned in the tender item, the tendered rate for all items in tender shall cover all lifts and leads encountered for the executions of the work as directed.

### **12. CROSS DRAINAGE WORKS**

Though the contractor is required to construct cross drainage works as per the drawings/design, he shall ensure that the drainage area does not get reduced and there is no water stagnation.

### **13. SHUT DOWNS**

The works of cross connections to existing lines are to be arranged in such a way as no major shutdowns are required to be taken and work completed within minimum period of time, without interrupting the major water/sewer/electrical supply in the area.

### **14. SUPPLY OF MATERIALS BY THE CONTRACTOR**

- 14.1.1 The contractor shall supply all the materials required for the work. These shall be conforming to relevant Specifications/IS codes & approved by the Engineer in Charge/ASCDCL.
- 14.1.2 Materials such as cement, TMT bars etc. shall be conforming to relevant IS codes. Testing charges for cement, steel shall be borne by the contractor.
- 14.1.3 In case of item of structural steel, and reinforcement, secured advance on signing of indenture as per Annexure 14, will be payable if requested by the contractor. The contractor shall not remove any material from the site without written approval of the Engineer in Charge.
- 14.1.4 The contractor shall provide, at the site of work, satisfactory storage for not less than one month's average consumption for works and shall keep the cement and steel in storage. The record of storage and utilization of cement and steel shall be maintained by the contractor in the order of its arrival at the stores and issue which would at any time show the dates of receipt and proposed utilization of cement and steel lying in the stock as per requirements of the Engineer in Charge/ASCDCL.
- 14.1.5 The stacking and storage of building materials at site shall be in such a manner as to prevent deterioration or inclusion of foreign material and to ensure the preservation of the quality, properties and fitness for the work. Suitable precautions shall be taken by contractor to protect the materials against atmospheric action, fire and other hazards. The materials likely to be carried away by wind shall be stored, in suitable stores or with suitable barricades and where there is likelihood of subsidence of soil, heavy, materials shall be stored on paved platforms. Suitable separation barricades and enclosure as directed shall be provided to separate materials brought by contractor and material issued by Govt. to contractor under Schedule - A. Same applies for the materials obtained from different source of supply.
- 14.1.6 The Engineer in Charge shall at all the times have access to the stores and sites, method of storage, records and securities provided by the contractor. The contractor shall comply with instruction that will be given by Engineer in charge, in this behalf.
- 14.1.7 The contractor shall further at all times satisfy the Engineer in Charge/ the ASCDCL on demand any production of books, of submissions of returns in Proforma as directed, other proofs that the cement and steel are being used for the purpose.

**15. MATERIALS AND LABOURS:**

- 15.1.1 The Contractor shall make his own arrangements for obtaining materials required for the work. All the materials involved in the construction shall be of best quality and specifications and shall be got approved from the Engineer-in-charge before use. If necessary, materials shall be got tested from the Laboratory at his cost. Samples requiring approval shall be submitted by the Contractor to the Engineer-in-charge well ahead of their use so as to get the test report available before the use of each material. The samples shall be properly marked and got approved from the Engineer in Charge.
- 15.1.2 The Contractor shall provide all labour, skilled as well as unskilled, pegs, lime, strings, site- rails (wooden as well as Steel etc.) as and when required as per approved design and make available such other materials for surveying, lining out, setting out, checking of work, taking measurements, testing of structures, without any payment by the ASCDCL to him. He will also provide proper approach and access to all his works and stores without any extra cost over tendered rates for the items to be inspected.
- 15.1.3 Rates quoted include clearance of site from vegetation, weeds and rubbish/malba (prior to commencement of work and its closure) in all respects and hold good for work under all conditions of sites, moisture, weather etc.
- 15.1.4 Failure to comply with any of the above instructions will result in the ASCDCL's doing the needful at the risk and cost of the contractor. These conditions are for all items and as such no extra payment shall be made for observing these conditions.
- 15.1.5 The contractor shall make his own arrangements for quarrying of rubble, stone, murum, sand, lime, metal and removal of overburden etc., if any.
- 15.1.6 Unless a separate item is provided in Schedule 'B', dewatering of foundations in excavation and during the construction of foundation/Masonry if required shall be done by the Contractor without claiming extra cost.
- 15.1.7 Masonry shall be kept wet for at least 15 days and concrete work shall be kept wet for at least 21 days commencing from the date of its final laying in position. In case during execution curing is found inadequate, it will be carried out by ASCDCL and the cost thereof shall be recovered from the contractor. The contractor shall make his own arrangements for getting water at site at his own cost.

**16. EXTRAS, OMISSIONS AND DISCREPANCIES.**

In all the cases of the omissions, doubts or discrepancies in the dimension in the drawing and items of works, reference shall be made by the contractor or his engineer to the Engineer-in-Charge/the ASCDCL, whose elucidation and elaboration shall be considered final.

**17. PAYMENT AGAINST EXCESS QUANTITIES OF VARIOUS ITEMS**

Before making payment of excess quantities as per rules, the concerned Engineer-in-Charge / ASCDCL shall get himself satisfied regarding genuineness of the claim and exercise a compulsory check of minimum 10 % of measurements for a particular item. The Engineer in Charge after taking necessary approval of the Competent authority and also examining the correctness of claim, will allow deviations in the quantities

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and the contractor shall be authorized by the Engineer-in-Charge /the ASCDCL in writing.

The rates for the excess quantities beyond contract provisions shall be paid as per the agreement rates i.e. quoted rates by the contractor only.

### **18. SUPPLY OF RATE-ANALYSIS IN CASE OF EXTRA ITEMS**

In case of the Extra Items, the Contractor shall supply Rates, based on Analysis of labour and material components in case he is called upon to do so.

### **19. TOOLS AND PLANTS**

All tools, instruments and machinery and all other materials (not included in the Material Schedule 'A') shall be acquired by the Contractor. It is, however, open to the Engineer to lend or supply to the Contract implementation, machinery or other services not covered by the contract document which he may consider desirable and available with ASCDCL. For such tools, instruments, machinery and services provided, the Contractor will have to sign an agreement and pay Security Deposit and rental charges as may be fixed by the Engineer.

### **20. TIME OF COMPLETION OF WORK**

If at any stage of work, it is found that the execution of work is not as per the programme given in the Bar/PERT Chart, suitable compensation shall be imposed on the contractor as mentioned in the conditions/clauses of contract.

### **21. REVISION OF BARCHART AND NETWORK DIAGRAMS**

Activity in Bar chart and network diagram (CPM / PERT) shall be modified regularly in case any activity could not be done in time due to some extraordinary reason. The modified Bar Chart/Network diagram should be submitted for approval of Engineer-in-Charge or competent authority of ASCDCL, who will give approval.

### **22. SPECIAL CONDITIONS FOR GST:**

Rates for all type of materials are inclusive all taxes levied by Central Government, State Government or local bodies, except GST. Rates for supply of materials are inclusive of third party inspection charges, insurance, storage charges, overhead charges and transportation of materials up to site and stacking.

The offer to be quoted by contractor must be inclusive of all central/state and local bodies taxes as amended from time to time excluding "GST". No extra payment on this account will be made to contractor. GST shall be paid separately by ASCDCL on the bills raised by the Contractor.

**23. MEDICAL AND SANITARY ARRANGEMENT TO BE PROVIDED FOR LABOUR EMPLOYED IN THE CONSTRUCTION BY THE CONTRACTOR**

- a. The contractor shall provide an adequate supply of potable and adequate water for the use of labourers on works and in camps.
- b. The contractor shall construct adequate trenches, semi-permanent latrines for the use of labourers, Separate latrines shall be provided for men and women.
- c. The contractor shall construct sufficient number of habitable huts on a suitable plot of land for use of the labourers according to the following specifications.
- d. The social distancing shall be kept while deciding for living and working space for workers during Covid 19 pandemic.
- e. There should be no overcrowding, floor space at the rate of 3 sqm. (30 sq. ft) per head shall be provided. Care should be taken to see that the huts are kept clean and in good order.
- f. The contractor must find his own land and if he wants Govt. land, he should apply for it. Rent/Assessment for it if demanded will be payable by contractor. However, the Department does not bind itself for making available the required land.
- g. The contractor shall construct a sufficient number of bathing places. Washing places should also be provided for the purpose of washing clothes.
- h. The contractor shall make sufficient arrangement for drainage and sullage water as well as water from the bathing and washing places and shall dispose of this waste water in such a way as not to cause any nuisance.
- i. The contractor shall engage a medical officer for scanning and containment of disease including Coronavirus (Covid 19) at his cost. In case of emergency the contractor shall arrange at his cost-free transport for quick medical help to his sick workers.
- j. The contractor shall provide the necessary staff for erecting the satisfactory conservancy and cleanliness of the camp to the satisfaction of the Engineer-In-Charge. At least one sweeper per 200 persons should be engaged.
- k. The Assistant Director of Public Health shall be consulted before opening a labour camp and his instructions on matters such as Water Supply, sanitary, convenience for the camp site accommodation and food supply be followed by the contractor, etc.
- l. The contractor shall make arrangement for all antimalarial measures to be provided for the labours employed on the work. The anti-measures shall be as directed by Assistant Director of public health.
- m. In addition to above all provisions of the relevant labour Act pertaining to basic amenities to be provided to the labourer shall be applicable which will be arranged by the contractor.

**24 HANDING OVER OF WORK**

All work and material before taken over by ASCDCL will be entire responsibility of the contractor for guarding, maintaining and making good, any damage of any magnitude. Interim payments made for such work will not alter this position. The handing over by the contractor and taking over by the CEO or his authorized agent will be always in writing, copies of which will go to the CEO, signed by authorized representative of ASCDCL and the contractor.

Materials belonging to contractor if not removed from site of works after completion of the work within a period of 15 days shall be taken over by ASCDCL at contractor's risk and cost and then shall be auctioned at the contractor's risk and cost.



The amount so recovered shall be credited to contractor's account after recovery of any dues or over payments etc. Materials remaining unsold or unserviceable as per discretion of the Engineer/ASCDCL shall be confiscated destroyed or disposed off without any compensation to the contractor, who shall be responsible for all legal disputes at his own cost and consequences without reference to the department.

## 25 DURING DEFECT LIABILITY PERIOD

The **Defects Liability Period** is the period named in the Contract Data and calculated from the Completion Date. The defects liability period is 3 years.

1. Defect Liability shall mean the obligation of Contractor to undertake the following Works as per the specifications, to the satisfaction of Engineer- in-charge.

a. To complete any work which is outstanding in date stated in Taking Over Certificate within a stipulated time as directed by Engineer- in-charge and

b. To execute all work required to remedy defects or damage as may be as notified by Engineer- in-charge on or before the expiry date of the defects notified by the Engineer- in-charge for the Works or sections as the case may be. If a defect appears or damage occurs the Contractor shall be notified accordingly by the Engineer- in-charge or his authorized representative on his behalf. The Contractor shall remedy the defects/ damages notified to him within a time period as stipulated by Engineer- in-charge. If the Contractor fails to remedy/rectify the defects or damages by this notified date, it shall be executed at the risk and cost of Contractor.

2. The Contractor has to commence the remedying work as soon as possible and in any case not later the 3 days of its communication by the Engineer- in-charge and complete the same within 7 days maximum or in a time period as directed by Engineer- in-charge. In case the Contractor fails to start the remedying work within above specified period, the department will take necessary action to carry out such Works at the risk and cost of the Contractor and the amount so incurred will be recovered from the Contractor from any such amount payable to the Contractor by the Government or through the deposit available with the department and even as recovery of land revenues if necessary.

3 The agency will have to make all necessary arrangements for smooth flow of traffic till the time the remedying rectification work is completed or also this will be done by the department at the risk and cost of Contractor. The Contractor's liability of maintaining the road to the required specifications will commence right from the date of issue of notice to proceed with the work till the expiry of defect liability period. The extends to the untracked portion of work also.

### **Visit of Contractor During Defect Liability Period**

Contractor shall carry out one inspection in every 3 months during the first year after completion of the work and carry minimum 2 inspections per year for the remaining 2 years of Defect Liability Period. However during rainy season the Contractor shall undertake such an inspection every month till the monsoon is over. The inspection shall be in the company of the representative of Engineer- in-charge. The defects noticed during the inspections shall be recorded and signed by the Contractor and representative of Engineer- in-charge. The Contractor shall rectify the defects if any, within 7 days or such period as may be notified by the Engineer- in-charge.

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

**Form – B.1**  
**GENERAL RULES AND DIRECTIONS FOR THE GUIDANCE OF**  
**CONTRACTORS**

1. The Schedule of Rates applicable are State Schedule of Rates 2019-20, Public Works Department, Government of Maharashtra for civil items and Current Schedule of Rates, PWD, GoM 2018-19 for electrical items
2. All work shall be measured net by standard measurement and according to the rules and customs/specifications of the Maharashtra PWD. The Engineer's decision as to what is the custom in use will be final.
3. Unless otherwise specifically mentioned in tender items, the net dimensions of RCC or CC members actually cast are only admissible for payment under RCC or Plain CC items. If the dimensions in the drawings are less than the actual, the same (as per drawings) shall be measured for the payment. No increase in dimensions due to plastering or finishing shall be admissible for payment under RCC or plain CC items.
4. The tenderer will have to produce to the satisfaction of the accepting authority a valid and current license issued in his favour under the provision of Contractor Labour Regulation and Abolition Act. 1973 before starting work, failing with acceptance of the tender will be liable for withdrawal and Earnest money (Bid security) / Security Deposit shall be forfeited.
  - i. As per clause 6 of B-1 form, extension of time limit will be governed. If contractor fails to apply for extension of time limit as per clause 6 to keep the tender alive, ASCDCL will grant the extension considering the progress of work and in the light of clause 2. All T and P machinery shall be provided by the contractor. Non availability of the same shall not be an excuse for application for extension of time.
5. Price Variation Clause is not applicable to tender.
6. For providing electric wiring or water lines etc. recesses/conduits shall be provided if necessary, through walls, slabs, beams, etc. and later-on refilled it without any extra cost until and unless payable in the item as per Schedule B.
7. The electrical works shall be carried out by licensed electrician/workman only as per existing laws. In case, the contractor does not possess valid electrical license required to carry out electrical works, he shall associate electrical contractor possessing valid electrical license by entering into the collaboration agreement as per Annexure 12.
8. It is presumed that the contractor has gone carefully through the Standard Specifications (Vol I and II 1981 edition) and the Schedule of Rates, and studies of site condition before arriving at rates quoted by him. The special provisions and detailed specification of wording of any item shall gain precedence over the corresponding contrary provisions (if any) in the standard specification given without reproducing the details in contract. Decision of Engineer-in-Charge shall be final in case of interpretation of specification.
9. If the standard specifications fall short for the items quoted in the schedule of this contract, reference shall be made to the latest Indian standard specifications, I.R.C. code, if any of the item of this contract do not fill in reference quoted above the decision and specification as directed by the Engineer-In-Charge shall be final.
10. Other unforeseen items to be executed in course of work shall have to be done by the contractor as per specifications, in P.W.D. Hand book volume I and II (Latest Edition), I.S. code of practice and as per standard specifications book of latest edition in precedence.
11. Extra charge of claims in respect of extra work shall not be allowed unless the work to which they relate are in the spirit and meaning of the specifications or unless such

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- works are ordered in writing by the Engineer-in-charge and claimed for in the specified manner before the work is taken in hand.
12. All the materials used in the work shall be of best quality and the material rejected shall be removed from the site by the contractor within 36 hours in the presence of the Engineer in charge at his (Contractor's) own cost.
  13. The contractor shall make his own arrangement for receiving all materials, tools, machinery etc. required for the work. No extra charges for the carriage of any material or water shall be allowed.
  14. The rates for all items are inclusive of all materials and transportation charges such as carting, lifting etc. No extra payment for any lead and lifts shall be paid for any item.
  15. It is mandatory on the part of contractor to carry out all the required tests of various construction materials for the works as mentioned in Schedule B of the tender. If the contractor fails to submit required test results of the various construction materials, he shall be liable to deposit the amount at penal rate of five times of the amount of particular test which he has not carried out. In case, the contractor fails to deposit the said amount or to carry out the required test(s) within ten days as asked by the Engineer in Charge, the said tests will be carried out by the Department and total expenditure incurred on the testing charges plus five times amount of testing charges shall be recovered from the contractor's bill. The decision of Engineer in Charge shall be final and binding and cannot be challenged by the contractor by way of Appeal, Arbitration or in the Court of Law.
  16. All material such as sand, aggregates, cement, steel, bricks, water etc. required of construction as per the requirements and directions of the Engineer in Charge shall be got tested from Regional Testing Laboratory/Govt. Polytechnic/Government Engineering college or at any laboratory approved by Engineer-in-Charge. Then it shall be allowed to be used. The cost of all the testing charges shall be borne and paid by the contractor. In case of legal disputes for materials not approved and brought and stored at site without permission of the Engineer/ASCDCL, the contractor shall be responsible for all legal disputes at his own cost and consequences without reference to the department.
  17. The entire responsibility of the testing of materials shall rest with the contractor. The cost of all the testing charges shall be borne and paid by the contractor.
  18. Potable water of good quality for labour, construction, washing and such other purposes shall be provided by the contractor without any claim for extra cost.
  19. The final bill and deposits shall not be paid unless the site is cleared off all rubbish materials and contractor's stores etc from the site of the work.
  20. The contractor shall have to pay the royalties and municipal taxes, if chargeable. The same shall not be refunded.
  21. The contractor shall be responsible for obtaining permission from Government local bodies, private party for storing, stacking of materials required for execution of work.
  22. Necessary sign board, danger flags, red lamps shall be provided by the contractor to avoid accidents. Necessary guarding shall also have to be provided.
  23. All necessary arrangements of safety shall be made by the contractor at his own cost.
  24. No electric power supply and water shall be provided by the ASCDCL during construction and testing of various structures/services. The contractor shall have to make his own arrangement for the same at his cost.
  25. The works under this contract shall not be sublet without written permission of the Engineer-in-Charge.
  26. The tender Rates are inclusive of all taxes except GST. There shall be no corrections or overwriting and if any that shall be dully initialled by Contractor himself.

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Note: The Commercial Offer (Financial bid) must be filled online using individual's digital certificate. (An online form will be provided for this during online bid preparation stage).

27. **Tender Percentage for Royalty and Testing charges:-** The percentage rate figure (Above or Below percent) accepted by the Bidder in the Form of Bid shall **not be applicable** on the items of Royalty, Consultancy and Testing charges work included in Schedule "BoQ".

I / We hereby, tender for the execution for Aurangabad Smart City Development Corporation Limited (herein before and herein after referred to as ASCDCL) for the work specified in the underwritten memorandum within the time specified in such memorandum at-\_\_\_\_\_ in figures (\_\_\_\_\_) in words percent below/above the estimated rates entered in schedule 'B' memorandum showing items of work to be carried out and in accordance with all respects with the specifications, designs, drawings, and instructions in writing referred to in Rule hereof and in clause 12 of the annexed conditions of the contract and agree that what materials for the work are provided by ASCDCL such materials are at the rates to be paid for them shall be as provided in schedule "A" hereto.

**TECHNICAL SPECIFICATIONS**

A.The work shall be carried out as per practices, procedures and specifications laid down in P.W.D. Hand book Volume -I & II Latest Edition and Public Works Department's Standard Specifications (Latest Publication of Government of Maharashtra) with amendments from time to time and as per I.S. applicable for respective items of works, as directed by the Engineer in charge.

B.The Schedule applicable is State Schedule of Rates 2019-20, Public Works Department, Government of Maharashtra for Civil items and Current Schedule of Rates, PWD, GoM 2018-19 for electrical items. Coefficients of items shall be derived from the said State Schedule of Rates and theoretical consumption shall also be derived from the same.

**1. CEMENT**

- a. The contractor shall procure 43 grade Ordinary Portland Cement conforming to IS 8112/Portland Pozzolana Cement conforming to IS:1489 (Part-I) as required in the work, from reputed manufacturers of cement such as ACC, Ultratech, Vikram, Shree Cement, Ambuja, Jaypee Cement, Century Cement & J.K. Cement or from any other reputed cement Manufacturer having a production capacity not less than one million tonnes per annum as approved by ASCDCL.
- b. The supply of cement shall be taken in 50 kg. bags bearing manufacturer's name and ISI marking or as decided by the Engineer in Charge. Samples of cement arranged by the contractor shall be taken by the Engineer-in-charge and got tested in accordance with provisions of relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected, and it shall be removed from the site by the contractor at his own cost within 36 hrs of written order from the Engineer- in-charge to do so.
- c. The cement shall be brought at site in bulk supply of approximately 50 tonnes or as decided by the Engineer in Charge. The cement godown of the capacity to store a minimum of 2000 bags of cement or as decided by the Engineer in Charge shall be constructed by the contractor at site of work for which no extra payment shall be made.
- d. Double lock provision shall be made to the door of the cement godown. The keys of one lock shall remain with the Engineer-in-Charge or his authorized representative and the keys of the other lock shall remain with the contractor. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer-in-Charge at any time.
- e. The cement shall be got tested by the Engineer-in-charge and shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation cost to testing laboratories.
- f. The actual issue and consumption of cement on work shall be regulated and proper accounts maintained. The theoretical consumption of cement shall be worked out. In case the cement consumption is less than theoretical consumption including permissible variation, recovery at the rate of 10% over the market rates shall be made. In case of excess consumption no adjustment will be made.
- g. The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Engineer-in-charge. If he does not do so within

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

3 days of receipt of such notice, the Engineer-in-charge shall get it removed at the cost of the contractor.

### 2. STEEL REINFORCEMENT

#### 2.1 Details

- a. The contractor shall procure Fe415D/Fe500 conforming to IS 1786-2008 from steel producers such as SAIL, Tata Steel Ltd., RINL, Jindal Steel & Power Ltd. and JSW Steel Ltd.. In case of non-availability of steel from such Producers ASCDCL may permit use of reinforcement bars procured from other main producers conforming to IS 1786-2008, having valid BIS licence but a reduction in the rates of items of TMT reinforcement bars shall be made @ Rs 5/- per kg.
- b. The TMT bars shall conform to IS 1786 pertaining to Fe 500 D or Fe grade of steel as specified. Steel reinforcement of Grade Fe 415 D shall be used however, high strength deformed steel bars, produced by thermomechanical treatment process of grade Fe 500 and Fe 550 having elongation more than 14.5% and conform to other requirements of Fe 500 D and Fe 550 D respectively of IS 1786 may also be used for reinforcement.
- c. The contractor shall have to obtain and furnish test certificates to the Engineer-in-charge in respect of all supplies of steel brought by him to the site of work.
- d. Samples shall also be taken and got tested by the Engineer-in-Charge as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time or written orders from the Engineer-in-Charge to do so.
- e. The steel reinforcement bars shall be brought to the site in bulk supply of 10 tonnes or more, or as decided by the Engineer-in-charge.
- f. The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to prevent their distortion and corrosion, and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.
- g. For checking nominal mass, tensile strength, bend test, re-bend test etc. specimens of sufficient length shall be cut from each size of the bar at random, and at frequency One test for every 5.0 METRIC TONNE or part thereof for each diameter.
- h. The contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories. The cost of tests shall be borne by the contractor.
- i. The actual issue and consumption of steel on work shall be regulated and proper accounts maintained. The theoretical consumption of steel shall be worked out as per procedure prescribed and shall be governed by conditions laid therein. In case the consumption is less than theoretical consumption including permissible variations recovery at the rate 10% extra over market rates shall be made. In case of excess consumption no adjustment need to be made.
- j. The steel brought to site and the steel remaining unused shall not be removed from site without the written permission of the Engineer-in-charge.
- k. The item provides for HYSD bars and TMT bars (conforming to IS 1786, 2008 or its latest edition) cutting, bending with G.I. wire and placing in position, reinforcement in the RCC.

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- l. The binding wire shall conform to Specification A-15 of Standard Specification of Public Works Department, Latest Edition.
- m. During contractor's supply, if any, the steel bars shall be supplied directly to the site of work.
- n. Bars shall be bent cold only. In no way bending by heat shall be allowed.
- o. Bars with kinks, bends or cracks shall not be used.
- p. Details of length, size, laps and bending diagram shall be got approved by the Engineer-in-charge.
- q. As far as possible full length of bars shall be placed as per drawing details. When full lengths are not available, bars be supplied only after written permission of the Engineer-in-charge. Supplies shall be staggered and in tension zone shall be avoided strictly. Bars shall be lapped as specified in IS:456-2000 with due regards to the grade of concrete. Welding may be used for large diameter of bar only after permission of Engineer-in-charge.
- r. All reinforcement shall be accurately placed in position with spacing and cover shown in detailed drawing and firmly held during the placing and setting of concrete. Bars shall be ties at all intersections. Binding wire of 1.63 mm or 1.22mm diameter (about 16 or 18 gauge) shall be used. Spacing of the bars shall be maintained by means of stays, blocks ties, spacers, hangers or other approved supports at sufficient close intervals so that bars shall not be displaced. During placing vibrating or compacting concrete, placing bars for reinforcement on a layer of fresh concrete as the work progress shall not be permitted. The use of pieces of broken stones or bricks or wooden blocks for maintaining spacing or cover shall not be permitted. Layers of bars shall be separated by precast cement blocks, spacer bars or other devices.
- s. Full details of numbers, sizes, lengths, weights, laps, welds, spacing of bars placed in position in different parts of the work shall be recorded by the contractor and certified and signed by the Engineer-in-charge or his representative to show that all reinforcement has been placed correctly as per sanctioned drawing or as directed by the Engineer-in-charge in writing, before placing concrete. No concrete shall be placed in position until the certified the correctness of reinforcement, recording the steel measurements and has given permission in writing to place concrete. After approval of reinforcement as above, it shall be the contractor's responsibility to seal that the spacing of reinforcement and arrangements are not tampered with in any way before or during concreting.
- t. Any steel is required to be procured by Contractor. He shall produce the test certificate. In addition, actual tests shall also be carried out.
- u. The cost of all operations including the following are included in the agreement;
  - i. Cost of labour, materials, use of tools, plant and tackle and other incidental items to complete the work satisfactorily
  - ii. Supplying, conveying, cleaning, cutting, bending, binding with (1.63 mm or 1.22 mm diameter –16 to 18 gauge) wire on spot, welding and placing reinforcement in position and maintaining it clean and in position till the concrete is laid.
  - iii. Cost of sampling and testing, as required.
- v. In no case, any foreign material e.g. oil, grease, etc. which prevent bonding between steel and concrete shall remain on steel on steel bars during placing of concrete.

### 2.2 Mode of measurement and payment

The tender rate shall be on weight basis for steel reinforcement as per the item given in BOQ. The lengths of the bars shall be measured correct to 2 places of decimals of



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meters. The weights for payments shall be calculated according to standard weights mentioned in the ISI Hand Book correct upto 0.10 Kg.

The measurement under RCC works for net dimension cast as directed without allowance for rendering finishing etc.

### 3. CONCRETE

- a. The charges for design of concrete mix shall be entirely borne by the contractor.
- b. The concrete used will be either from batch mix plant or Ready Mix Concrete from approved plant by ASCDCL. In case, small quantity of concrete is required, mixing shall be done in concrete mixer only on approval of ASCDCL.
- c. The concrete shall be used as per the design requirements and as directed by Engineer in Charge.

#### 3.1 DESIGN MIX

Design mix concrete shall be used in entire work in which the design of mix i.e. the determination of proportions of cement, aggregate & water is arrived as to have target mean strength for specified grade of concrete. The mix as described in the item shall be used in all structural elements in entire work. The mix design shall be carried out for concrete grade above M20 grade. If the consumption as per approved mix design varies (more or less 5%) from standard consumption, accordingly the positive difference in the cost of cement shall not be paid to the contractor.

- a. Mix proportions shall be designed to ensure that the workability of fresh concrete is suitable for conditions of handling and placing, so that after compaction it surrounds all reinforcement and completely fills the formwork. When concrete is hardened, it shall have the stipulated strength, durability and impermeability.
- b. Determination of the proportions by weight of cement, aggregates and water shall be based on design of the mix. As a trial the manufacturer of concrete may prepare a preliminary mix according to provisions of SP: 23. Reference may also be made to ACI 211.1-77 for guidance.
- c. Mix design shall be tried and the mix proportions checked on the basis of tests conducted at a recognized laboratory approved by the Engineer-in-Charge. All concrete proportions for various grades of concrete shall be designed separately and the mix proportions established keeping in view the workability for various structural elements, methods of placing and compacting.
- d. Before using an admixture in concrete, its performance shall be evaluated by comparing the properties of concrete with the admixture and concrete without any admixture. Chloride content of admixture should be declared by the manufacturer of admixture and shall be within limits stipulated by IS:9103.
- e. Standard deviation calculations of test results based on tests conducted on the same mix design for a particular grade designation shall be done in accordance with IS 456.
- f. Acceptance Criteria for Design Mix will be based on the following criteria;
  - i. Compressive Strength : The concrete shall be deemed to comply with the strength requirements when both the following condition are met: (a) The mean strength determined from any group of four consecutive test results complies

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- with the appropriate limits (b) Any individual test result complies with the appropriate limits.
- ii. Flexural Strength : When both the following conditions are met, the concrete complies with the specified flexural strength. (a) The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm<sup>2</sup> . (b) The strength determined from any test result is not less than the specified characteristic strength/ 0.3 N/mm<sup>2</sup>
  - iii. Quantity of Concrete Represented by Strength Test Results : The quantity of concrete represented by a group of four consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches.
  - g. Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measured to the satisfaction of the Engineer in-Charge.
  - h. Cement Content of Concrete: For all grades of concrete manufactured/produced, minimum cement content in the concrete shall be 330 kg per cubic metre of concrete. Also, irrespective of the grade of concrete the maximum cement content shall not be more than 500 kg per cubic metre of concrete. These limitations shall apply for all types of cements of all strengths. Actual cement content in each grade of concrete for various conditions of variable shall be established by design mixes within the limits specified
  - i. Water Cement Ratio and Slump: In proportioning a particular mix, the manufacturer/ producer/ contractor shall give due consideration to the moisture content in the aggregates, and the mix shall be so designed as to restrict the maximum free water cement ratio to less than 0.5. Due consideration shall be given to the workability of the concrete thus produced. Slump shall be controlled on the basis of placement in different situations. For normal methods of placing concrete, maximum slump shall be restricted to 100 mm when measured in accordance with IS 1199.

Specified Grade	Mean of the Group of 4 Overlapping Consecutive Test Results in N/mm <sup>3</sup>	Individual Test Results in N/mm <sup>3</sup>
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1	2	3
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M15 and above	$> f_{ck} + 0.825 \times \text{established standard deviation (rounded off to nearest 0.5 N/mm}^2 \text{ ) or } f_{ck} + 3 \text{ N/mm}^2 \text{ whichever is greater}$	$\geq f_{ck} - 3 \text{ N/mm}^2$
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### Notes:

- In the absence of established value of standard deviation, the values given in Table may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- For concrete of quantity up to 30 m<sup>3</sup> (where the number of samples to be taken is less than four as per frequency of sampling, the mean of test results of all such samples shall be  $f_{ck} + 4 N/mm^2$ , minimum
- j. viii. Approval of Design Mix: The producer/ manufacturer/ contractor of concrete shall submit details of each trial mix of each grade of concrete designed for various workability conditions to the Engineer-in-Charge for his comments and approval. Concrete of any particular design mix and grade shall be produced/ manufactured for works only on obtaining written approval of the Engineer-in-Charge. For any change in quality/ quantity in the ingredients of a particular concrete, for which mix has been designed earlier and approved by the Engineer-in-Charge, the mix has to be redesigned and approval obtained again.

### 3.2 REQUIREMENT OF STRENGTH OF CONCRETE

- i. The contractor shall make field arrangements for testing of all materials for cement concrete i.e. slump test, compressive strength test etc. The concrete cube moulds 6Nos. of 150 x 150 x 150 mm size shall be prepared during concreting operation. Six cubes shall be prepared at site from the concrete being placed in the works during concreting and shall be subjected for compressive strength test, for each concreting operation of the structures. Three cubes shall be tested at 7 days age and three at 28 day stage.
- ii. The concrete shall be acceptable if it fulfils the requirements as laid down in IS 456, 2000.

### 3.3 EXCAVATION IN SOFT AND HARD STRATA

#### 3.3.1 GENERAL

The specifications contained in the standard specification volume II and published by Public Works and Housing Department, Govt. of Maharashtra, shall apply. In addition to above following specification shall apply. In case of any discrepancy between the two the below given specifications shall govern.

#### 3.3.2 SITE CLEARANCE

The area to be excavated shall be cleared off. All weeds, bushes and rubbish and other objectionable materials removed shall be disposed off as directed by the Engineer-in-Charge. The cost of such clearing shall be deemed to have been included in the rates accepted for different items under excavation.

#### 3.3.3 DEWATERING

No distinction shall be made as to whether the materials being excavated is dry, moist or wet. The item also includes bailing out of water by manually or pumps to keep the trenches reasonable dry for all further works.

The rate of the items requiring dewatering viz. excluding foundation concrete RCC or masonry shall be deemed to be inclusive of provision of dewatering and no separate claim shall be entertained. In any case no extra shall be paid for dewatering. The specifications hereunder shall cover diversion of streams, providing coffer dams,

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bunds, etc. as necessary for carrying out work and bailing out and pumping work as per requirement of work.

The foundation trenches shall kept dry by resort to pumping alone or pumping in combination with diversion, channels, cofferdams, bunds, diversion weirs, drainage channels, or other method suitable for the local conditions at the choice of the contractor. The responsibility of adequacy of dewatering arrangements and quality and safety of work rests solely with the contractor.

Though the method to be adopted is the choice of the contractor, the scheduled programme shall have to be strictly adhered to.

The contractor shall plan, construct and maintain necessary diversion and protective works, so as to keep the work safe at all stages. The coffer dams where required shall be carried out to required depths and heights and safety designed and constructed with suitable dimensions and protections and shall be made enough water tight for facility of construction inside it. The coffer dam shall leave sufficient clearance for construction and inspection facility and permit installation of pumping machinery as required.

The item includes the entire dewatering operation from start of work till its completion in all respect.

### 3.3.4 SHORING AND STRUTTING

The item includes all shoring and strutting that may be required. On no account the width of trenches more than those mentioned in the drawings shall be measured. If excavation width more than the specified is required for the purpose of easier working, due to loose material or any other reasons, the same shall be at the Contractors cost.

### 3.3.5 LIGHTING, BARRICADING AND GUARDING

The items of excavation are including necessary lighting at night at suitable intervals, and barricading the same so as to avoid the accident. Guards/Chowkidars shall be employed at place wherever required. The arrangements shall be maintained till completion of work and at the cost of the Contractor.

### 3.3.6 ALIGNMENT AND LEVELS

Before the trenches excavation is commenced, sight rails shall be erected at every 30 meters and at all points of change of direction, gradient and at ends. The excavation work shall be preceded by a detailed survey along the alignment of the main to obtain ground levels at every 30 meters or less distance. Temporary bench mark shall be constructed at every 150 meters distance along the alignment and shall be maintained till the completion of work. All labour and materials required for the survey work of fixing bench mark etc. shall be provided by the Contractor at his own cost. For any mistakes in survey the Contractor is fully responsible. He should not construct the boundary wall, unless the alignment is thoroughly checked by the Engineer-in-Charge or his authorized representative who is empowered to sign the work order/site order book in token of checking the exact grade and level of the trenches excavation.

Excavation at random places shall not be measured. Any non-technical practices during the excavation of the contracted work shall be viewed very seriously by the

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ASCDCL and a note to that effect shall be recorded against the Contractor in his name.

### 3.3.7 CLASSIFICATION OF SOIL

The exact classification of the soil strata met with during the excavation shall be done by the representative of Engineer-in-Charge and accordingly measurement shall be recorded under different items of excavation. In case of any dispute regarding classification of soil classification, the decision of Engineer-in-Charge shall be final and binding. Excavation in hard rock shall be done by chiselling, wedging or line drilling by mechanical means or as per directions of Engineer in Charge. The excavation refers to excavation generally for foundation, wet or dry, in hard rock by chiselling, wedging or line drilling. In case, hard rock is available, footing shall be placed after levelling with plum concrete subject to the condition that minimum 50 cms foundation depth is available.

### 3.3.8 Additional specifications for use of VSI Crushed sand/Artificial sand/Fine aggregates

- i. Such sand is referred as crushed sand and will be as defined in IS383.
- ii. Crushed sand will conform to IS383
- iii. Crushed sand shall be free from dust and deleterious materials
- iv. The crushed sand shall be manufactured using Automatic Vertical Shaft Impactor type crusher only.
- v. The quantity of microfines (Particles below 75 microns) in crushed sand shall not be more than 7%.
- vi. The contractor shall intimate the Engineer in Charge regarding the source of supply of crushed sand. The source of supply of crushed sand shall be got approved by the Engineer in Charge prior to start of work.
- vii. Each load of crushed sand whenever brought on site shall be tested for Fineness Modulus. Fineness modulus shall be within permissible limits. If it doesn't fall within acceptable limits, it shall be rejected.
- viii. The test of compressive strength of concrete/mortar using crushed sand shall be carried out in presence of Engineer in Charge or his representative.
- ix. The flakiness index and elongation index tests shall be within permissible limits.
- x. The concrete mix design for each grade of concrete using crushed sand shall be carried out only in Government quality control lab and the same Mix Design shall be adopted.
- xi. As far as possible freshly produced crushed sand shall be used. Stored crushed sand shall not be used.
- xii. For plastering purposes, if the use of crushed sand is proposed, it shall be used with addition of super plasticizers at the rate of 100ml/bag without extra cost to ASCDCL.
- xiii. Necessary bond regarding the use of crushed sand shall be submitted by the contractor clearly stating that, if any defects are observed during execution and defect liability period, the same shall be rectified at his own risk and cost.
- xiv. Grading zone II sand as per IS383 only shall be used for concreting.
- xv. Reversible drum type/batch mix plant (pan type) concrete mixer shall be used for concrete.
- xvi. Crushed sand shall not be used for prestressed concrete works.

**LIST OF APPROVED MAKES**

**Note:**

1. The Engineer-in-charge is at liberty select any of the brands indicated below. The contractor obtain prior approval from Engineer-in-charge. In charge before placing order for any specific material may approved order any the ‘Makes’ or ‘Brands’ listed below.
2. All materials should confirm to relevant standard and codes of BIS and shall have ISI mark.
3. In case of items for which approved make / vendor is not given below .the Contractor shall with the prior approval of the Engineer-in-charge. In charge procure the same of the first quality and satisfy the Engineer-in-charge before use in the works.
4. In case of Contradiction between the approved makes/vendor specified below and mentioned in the Specifications /Bill of quantities. The decision of the Engineer-In-Charge shall be final and binding on the Contractor.

<b>Sr. No</b>	<b>Material</b>	<b>Approved Manufactures</b>
1	REINFORCED STEEL	TISCO, TATA, KALIKA, RAJURI
2	CEMENT	ACC, ULTRATECH, AMBUJA
3	CERAMIC TILES / VITRIFIED TILES (1st QUALITY)	JOHNSON & JOHNSON, KAJARIYA, BELL, NITCO,SOMANY
4	SILICA GRANULAR PLASTER	HERITAGE (M/s BACKELITE HYLAM LTD.)
5	SYNTHETIC PLASTER /PIANT	RENOVO (M/s Damany Dye Chem. Pvt.Ltd.)
6	WATER PROOFING COMPOUND	FOSCROCK, IMPERMO, DR. FIXIT, ULTRATECH
7	PLASTICIZERS ETC.	MC BAUCHEMEL, FOSCORCK, CHEMISOL, NAICHEM

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8	MEDIUM DENSITY FIBER Boards	
9	ALUMINIUM SECTIONS	JINDAL, HINDALCO, FENESTA , ALUMINIMUM
10	POLYSTER SUN CONTROL FILM	GARWARE, SUNFLEX, BALSON,PALSCHEM
11	GLASS	TRIVENI,SHREE VALLABH INDOSHHANI, MODIFOLAT GLASS, HINDUSTAN NATIONAL, SAINT GOBAIN
12	MIRROR	ATUL,GOLD FISH, MODIGUARD, SAINT GOBAIN, ASSAHI
13	HYDRAULIC DOOR CLOSER	EVERITE, DOORKING, EVEREST, GALTERS , HINDUSTAN
14	GYPSUM BOARD	SYPSUM INDIA, INDIA GYPSUM, SAINT GOBAIN
15	LAMINATES SHETS	ARELAM, MARINO, GREEN LAM
16	BITUMEN IMPREGNATED BOARD	SHALTEX (M/S SHALIMAR)
17	MORTISE LOCK & LATCH	GODREJ, HARISON, EROUA
18	ROLLING SHUTTER	KESHAVRAM RAMYUS, DHIMANI,
19	PRINTER	ASIAN, BERGER, J&N.
20	ACRYLIC PLASTIC EMULSION (1* Quality )	ASIAN, BERGER, J&N.
21	CEMENT PAINT	SNOWCEM, TERRACO, SURFALM
22	SYNTHETIC ENAMEL PAINT	ASIAN, BERGER, ICL, J & N
23	ROAD PAINTS	NEROLAC, BERGER, ICL,ASIAN
24	ADHESIVE	BAL ENDURA PIDILITE VEMICOL, FEVICOL
25	HARDWARE FITTING	EVERLITE, ECIE, APEX, CNR
26	SANITARY WARE	KOHLER, JAGUAR, CERA,

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27	E.W.C. SEAT COVERS	KOHLER, JAGUAR, CERA,
28	C.P. FITTING	KOHLER, JAGUAR, CERA,
29	SOIL & WASTE PIPE	BHARAT, AJAY PIPE, ASTRAL,SUPREME (CONFORMING TO IS-3839)
30	G.I. PIPES	ZENITH, TATA, IST, GST., GSL
31	GUN METAL VALVES	LEADER ENGG KIRLOSKAR GG.
32	FLUSH VALUE	KOHLER, JAGUAR, CERA,
33	CISTERN	KOHLER, JAGUAR, CERA,
35	C.I. SLUISE VALVE	KIRLOSKAR, INDIAN VALVE, LEADER,BURN
36	C.I. MANHOLE	B.C. IRON RIF (AGRA)
37	G.I. FITTING 1ST QUALITY	ZENITH,TATA, R.M. ENGG. WORKS, SWASTIK
38	P.V.C. FITTINGS	FINOLEX, AJAY PIPE, ASTRAL
39	CONCRETE ADMIXTURES	FOSCROC, PIDLITE, BASF
40	ANTISTATIC FLOORCOATING	INARCO,PVC WONDER FLOOR, ARMSTRON.

In addition to the condition of contract described before, following General Condition shall also become part of this bid document and will later become part of the contract.

**1.0 Water Supply for Construction**

The water procurement responsibility for construction work as well as drinking for labour etc. shall solely on the Contractor. No Payment on account of water shall be



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admissible to the bidder irrespective of water lead, lift and cost. Before quoting the bidder shall assess the availability of the water at site. In case the contractor desires to have a bore well on the site of work and utilize the water available from the same, necessary permission may be sought from the Engineer-in-charge subject to the condition that –

- a) The cost of bore, piping and pumping machinery is borne by the Contractor and the use of water shall be allowed free of charge.
- b) The quality of water is to be found suitable for construction / drinking after testing of the same in the approved laboratory.
- c) The bore well, piping and pumping machinery shall become the property of the employer after completion of the work without any claim cost of the same by the contractor.
- d) The availability of the water in sufficient quantity and of suitable quality shall be the responsibility of the contractor.

Contractor to make his own arrangement for supply, storing, temporary piping etc. at his own cost.

**SPECIFICATION FOR FORMWORK AND STEEL CENTERING**

**A) FORM WORK :-**

**1. Formwork:**

Form work shall include all temporary forms of moulds required for forming the concrete which is cast in site together with all temporary construction required for their support. Unless otherwise stated all formwork shall conform

I.S. specifications

**2. Design of Form work :-**

Form work including complete false work shall be designed by the contractor in accordance with I.S 2750,4041 and all other relevant I.S codes without any extra cost to the Employer and these shall be got approved from the Engineer before any form work is taken up

The contractor entirely be responsible for the adequacy and safety for false work not with standing any approval or review by the Engineer of his drawing and Design. Proprietary system of formwork, if used a detailed information shall be furnished to the engineer of approval

**3. Quality of shuttering :-**

The shuttering shall have smooth and even surface and it's joints shall not permit leakages of cement slurry.

Ply-board shuttering material to be used for sides of beams and columns shall be marine or laminated plywood well seasoned tree free from projecting nails ,splits or other defects that may mark on the surface of concrete. It shall not be so dry as to absorb water from concrete and swell and bulge or so green or wet as to shrink after erection. Mild steel plates or plywood shall be used for slab and beam bottoms.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

The timber shall be accurately sawn and planed on the sides and the surface coming in contact with concrete.

So far as practicable clamps shall be used to hold the forms together where use of nails in unavoidable minimum number of nails shall be used and these shall be left projecting so that they can be easily with drawn. Use of double headed nails shall be preferred

#### **4. Tolerance :**

The form work shall be made so as to produce finish concrete true to shape , lines, levels , plumbs and dimensions as shown on the drawings , subject to the following tolerance unless otherwise specified in this documents or drawings or as directed by the Engineer.

- a) Section dimension = 5mm.
- b) Plumb = 1 in 1000 of height
- c) Levels = 3mm. before and deflection has  
been taken place.

Tolerance given above are specified for local aberrations in the finished concrete surface and should not be taken as tolerance for the entire structure taken as a whole or for the setting and alignment of formwork, which should be as accurate as possible to the entire satisfaction of the Engineer. Errors if noticed in any lift/tilt of the structure after stripping of forms , shall be corrected in the subsequent work to bring back the surface or the structure to it's true alignment .

#### **5. Special Provisions :**

When ever the concreting of thinner members is required to be carried out within shutters of considerable depth, temporary opening in the sides of the shutters shall, if so directed by the Engineer by provided to facilitates the

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

pouring and consolidation of the concrete. Small temporary openings shall be provided as necessary at the bottom of the shutters of walls and deep beams to permit the expulsion of rubbish etc.

### **6. Removal of Formwork:**

The formwork shall be so removed as not to cause to damage the concrete . Centering shall be gradually and uniformly lowered in such a manner as to avoid any shock or vibration. Support shall be removed in such a manner as to permit the concrete to take stresses due to it's own weight uniformly and gradually.

The whole of the form work removed should be planned and definite scheme of operation worked out. Under no circumstances should forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected as the time for striking but not before the period as mentioned in I.S 456 where ordinary Portland cement is used.

### **B) STEEL CENTERING :**

#### **1. Work Include:**

Erecting steel centering with the contractor's materials comprising of standard steel adjustable props and standard steel trusses / joints / spans centering plate for the bottom of slab and plates for the bottom of the beams etc. of adequate strength properly balanced for obtaining adequate rigidity to with stand all loads coming in it including permanent and temporary fixtures and fastenings etc. complete for R.C.C members like beams slab and canopy including it's removal after the specified period stacking, making good the damaged parts / it's replacement before its next use with all leads and lift (all centering material shall be of contractor).

For R.C.C beams , lintels , arches etc. formwork shall be of the plywood of adequate thickness and grade only. The centering supporting arrangement

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such as standard steel trusses/ joints / spans standard adjustable / fixed props. H type frames etc. Shall be designed by the contractor and got approved from the Engineer before commencement of its erection . The contractor with prior approval from the engineer shall use standard steel centering arrangement which may be manufactured by the reputed firm.

The supporting arrangement design by the contractor shall be confirmed to the relevant I.S codes and standard practice adopted in this type of work. The centering arrangement shall be adequately braced and properly secured by using appropriate type of fastening and fixtures to ensure stability and rigidity of the centering to withstand all loads coming on it. The entire responsibility for design, erection, maintenance and safety etc. will exclusively rest with the contractor. The Engineer detailed reserves right to call the design calculation of the entire centering in event if which the contractor shall have to arrange for its replacement at his own cost.

### **2. Item to Includes**

The item Shall include erection of centering with M.S props , struts with all bracing, fastening and Fixtures, its removal after the specified period and its safe maintenance during the above period, cost of safety precautions required to be taken for the work men and Govt. Property, stacking of material after removal at suitable place, replacement of damages / wormed out parts , cleaning etc.

The material used for centering shall be the property of contractor and shall be slowed to taken away after completion of the work.

The centering Supporting arrangement should be designed by the contractor

. He may make use of standard centering arrangement made by the standard manufacturer such as Acro blue bird. All the relevant codes etc. will be followed and appropriate centering may be suggested The rate should include all temporary/ permanent arrangements including temporary

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fastening and fixtures. The centering material should be of contractor and he should take away from the site of work after completion of work, isolated lintels less than two meters in length chajja and plinth beam shall not be paid for centering under this item. The payment to the extent of completed R.C.C

work shall only be made irrespective of procured by quantity of centering material the contractor at the work side.

**GENERAL SPECIFICATIONS FOR WATER PROOFING**

**Rate for respective item shall include for the additional specifications:**

1. The work of water proofing described in the following items shall be carried out by the contractor only through the renowned specialist water proofing agency using cement waterproofing compounds, as approved in writing by the Executive Engineer.
2. The contractor shall give before actual execution, detailed specification for each item of work of waterproofing to be executed according to the specifications of the specialist agency he proposes to employ, for approval. The work shall not be started unless approval in writing is given by the Engineer in charge to the said specification.
3. The contractor shall give a guarantee bond on requisite stamp paper for a minimum period of 25 years for all the times of water proofing done. During the guarantee period the contractor shall entirely be responsible to rectify any defect at his own cost to maintain the work in waterproof condition. The waterproofing contractor shall also have to make good all the surroundings disturbed by him during the rectification work at his own cost. The form of written guarantee given on **Page No \_\_\_\_\_** shall be on a legal stamped agreement acceptable to the Government. The guarantee shall be given within one month from the date of completion of waterproofing treatment but any delay in furnishing, the guarantee shall not relieve the contractor from the implications of this clause.
4. 10 % (ten percent) of the cost of waterproofing work executed shall be retained as “Retention Money” for a period of Twenty Five years covering the guarantee and the same shall be released only after satisfactory performance of the treatment during guarantee period of 25 years.
5. The waterproofing agency shall provide and install at its own cost the following for its own use and remove the same after completion of the work.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- i) Two pumps electrical/ diesel operated for watering and curing at any level in the Building curing for all items shall be carried out for a minimum period of 14 days.
  - ii) Temporary Mild Steel water storage tanks.
  - iii) Temporary galvanized iron pipings and fittings for water line.
  - iv) Flexible hose lengths.
  - v) Cement godowns, site office.
6. Injections to reinforced cement concrete slab , whenever requires have to be undertaken by the contractor free of cost.
  7. Before starting the waterproofing work , the surface receiving the treatment shall be cleaned properly.
  8. The item of Water proofing as given in the Schedule 'B' / BOQ applies for work in any position and on any floor and at any height. The lift of material shall not from any criteria for extra payment.
  9. For the reference of contractor , guideline specification for water proofing are attached herein with the general Specifications.



**GENERAL GUIDELINES FOR WATERPROOFING WORK**

**FOR REFERENCE OF THE CONTRACTOR**

(Note:- The contractor is required to give detailed specifications for each item of the Waterproofing Work)

**1. ROOF SLAB AND TERRACE:**

Providing average 112 millimeters thick cement based waterproofing treatment with brick at the rain work pipe point and keeping the gradient not flatter than 1 in 100.

- a) Cleaning the surface to the requirements.
- b) Giving a coat of wash mixed with cement
- c) Providing 12 millimeters thick cement mortar bed with admixture of waterproofing compound to form a bed for bricks bats. Special care shall be taken at the Junction of parapet and Terrace slab to ensure gaps, if any, are properly sealed
- d) Placing brick bats of varying size (average 80 mm. thick) to a proper slope and grouting their joints with chemical process in cement mortar with 2% with water proofing compound
- e) Providing all around the terrace large waterproofing watts (rounding) upto a height of 30 cm. .In P.C.C or as directed above the finished level of waterproof treatment.
- f) Finishing curing for 14 days.
- g) Carrying out test. Payment for item shall be released only after results of pound test are satisfactory .

**2. TOILETS:**

- a) Cleaning the surface to the Department's requirements.
- b) Giving a coat of wash mixed with cement
- c) Providing 25 mm. thick waterproofing treatment to the bottom of toilet floors.
- d) Providing 20 mm. to 25 mm. thick cement mortar waterproof treatment to walls of the toilets upto the height of 1.00 meter above the finished floor level
- e) Providing waterproof of walls all around the toilets
- f) Grouting the mouths of inlets and outlets
- g) Filling sunk portion with brick bats including waterproof mortar and the top surface left rough to form a key for tiles.

**3. OVERHEAD TANKS:-**

The under some items in Schedule 'B' / BOQ of the tender pertains to constructions of underground / Overhead Water tank . After completion of the work , water tank as a whole shall be tested for water tightness and leakages, if any, shall be rectified forthwith without any extra cost to the Department

**GUARANTEE BOND FOR WATERPROOFING WORK**  
**(On stamp paper worthy Rs.100/-)**

Name of work: \_\_\_\_\_

Name of Agency :

Agreement No. :

The contractor hereby declares that the water proofing work carried out under contract shall be of the best quality and workman particulars contained /mentioned in the clausehereof and the contactor hereby guarantee that the said work would continue to confirm to the description and quality aforesaid for a period of **25 years** from the date of handing over the said work to the department and not with standing the fact that the Department may have inspected and or approved the said work be discovered not to confirm to the description and quality aforesaid or have deteriorated (and the decision of the Engineer-in –charge in that behalf will be final and conclusive)the Department will be entitled to reject the said work or such portion thereof as may be discovered not to conform to the said description and quality .

On such rejection , the work will be at the contractor’s risk and all the provisions herein contained relating to rejection of the work etc. shall apply. The contractor shall , if so called upon have to make good the work etc. or such portion thereof , as is rejected by the engineer in Charge , otherwise the contractor shall pay to the department, such damages , as may arise be the reason of the breach of the condition herein contained. Nothing herein contained shall prejudice any other right of the Department on that behalf under this contract or otherwise. 25 % amount of executed amount of water proofing (in addition to this bond) will be recovered from running /fina bill as a retention money this amount will be refunded to contractor after completion of defect liability period of Ten years prescribed for water proofing items

Date:

Place:

\_\_\_\_\_  
**Contractor**

**GUARANTEE BOND FOR ANTI TERMITE TREATMENT**  
**(On Stamps Paper worth Rs. 100)**

**Name of Work :-** \_\_\_\_\_

**Name for Contractor :-**

**Agreement No :-**

The contractor hereby declares that the Anti Termite Treatment carried out under this contract shall be of the best quantity and workmanship and shall be strictly in accordance with the specifications and particulars contained / mentioned in the clause hereof and the contractor hereby guarantees that the said work would continue to conform to the description and quality aforesaid for a period of **Ten years** from the date of handing Department may have inspected and or approved the said work, if during the aforesaid period of Ten years, the said work be discovered not to conform to the description and quality aforesaid or have deteriorated ( and the decision of Engineer in charge in that behalf will be final and inclusive ) the Department will be entitled to reject the said work or such portion thereof as may be discovered not to conform to the said description and quality. On such rejection, the work will be at the contractor's risk and all the provision herein contained relating to rejection of work etc. shall apply. The contractor shall, if so called upon have to make good the work etc. or such portion thereof, as is rejected by the Engineer in charge, otherwise the contractor shall pay to the department, such damages, as may arise by the reason of the breach of the condition herein contained. Nothing herein contained shall prejudice any other right of the Department on the behalf under this contract or otherwise.

\_\_\_\_\_  
**Place :**

*Signature of Contractor*

## **TECHNICAL SPECIFICATIONS FOR THE ELECTRICAL WORKS**

### **1 WIRING (WG)**

#### **General:**

All material shall be conforming to relevant standard as per BIS and shall carry ISI mark. If any particular category of material for which ISI mark is not available in market, it shall either carry valid 'Quality Control' certificate issued by the Chief Engineer (Elect), P.W.Dept. Maharashtra State Govt. as included in approved list.

Work shall be carried out as per the Method of Construction specified by BIS. If there is no reference for particular Method of Construction in IS, such work shall be carried out as per the approved Method of Construction specified in chapter 16 of P.W. Dept. Handbook.

Material and Work not qualifying to any provision mentioned above shall be to the satisfaction of the Engineer in Charge.

Material shall be tested in approved Testing Laboratory and shall qualify the relevant tests

as and when directed by Engineer In-Charge.

#### **Recommended Standards:**

The following list is showing Indian Standards, which are acceptable as good practice, and

accepted standards.

IS 732: 1989 Code of Practice for Electrical Wiring Installations?

IS 4648: 1968 Guide for Electrical Layout in residential buildings

IS 9537 (Part 1): 1980 Conduits for Electrical Installations: General requirements

IS 9537 (Part 2): 1981 Rigid Steel Conduits

IS 9537 (Part 3): 1983 Rigid Plain Conduits of insulating material

IS 3419: 1989 Specifications for fittings for rigid non metallic conduits

IS 694: PVC insulated cables for working voltages up to and including 1100V

IS 1554 (Part 1): 1988 PVC insulated (heavy-duty) electric cables for working voltages up to and including 1100V

IS 3961 (Part 5): 1968 Recommended current ratings for cables: PVC insulated light duty cables.

IS 4288: 1988 PVC insulated (heavy duty) electric cables with solid aluminium conductors for voltages up to and including 1100V

IS 14772: 2000 Specifications for Accessories for household and similar fixed Electrical Installations

IS 3043: 1987 Code of practice for Earthing

SP 30: 1984 National Electrical Code

SP 7 (Group 4): 2005 National Building Code

IS 14927 (Part 1): 2001 Cable Trunking and Ducting systems for electrical installations.

## **1.1 Conduits / Trunking (Casing Capping) (Surface type)**

### **1.1.1 PVC Conduits**

#### **Specification No (WG-MA/CON)**

#### **Scope:**

#### **PVC Conduits: Surface**

Providing specified PVC Conduits and erecting as per approved Method of Construction; on surface of wall / ceiling, etc. including entries through walls / slabs / flooring as per requirement, and with all necessary hardware, accessories such as Spacers, Saddles, Bends, Tees, Junction boxes, Check-nuts, etc.; making conduits erection work rigid and duly finishing, removing debris from site.

#### **Material:**

#### **PVC Conduit:**

PVC pipe minimum 20mm dia and above depending on No. of wires to be drawn (refer Table No. 1/2) ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or noninspection type Elbows, Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

**Hardware:**

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC/ fill type plugs, wooden gutties, etc.

**Method of Construction:**

**Erection PVC Conduits for Surface type wiring:**

**General:**

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5 mm, roundheaded screws for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers. Distance between 2 spacers shall not be more than 600mm. Size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/2 for PVC conduits). Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300 mm. or antielectrostatic partition/separate pipe should be used. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface and with colour coding conduit (For visual identification) as per Table No. 1/4. Flexible conduits shall be used at expansion joints.

**Especially for PVC Conduits of surface type wiring:**

In addition to general instructions above, all joints shall be made rigid with resin / adhesive. Wherever offsets are necessary, it shall be done with bending spring. Size of conduit shall be as per Table No. 1/2 for number of wires to be drawn through the conduit.

**1.1.2 PVC Trunking (Casing capping)**

**Specification No (WG-MA/CON)**

**Scope:**

**PVC Trunking:**

Providing specified PVC Trunking (Casing capping) and erecting as per approved Method of Construction, on surface of wall / ceiling, etc. including entries made

with PVC conduit through walls / slabs / flooring as per requirement with all necessary hardware, accessories such as inner / outer Elbows, Tees, Junction boxes, etc. and duly finishing, removing debris from site.

**Material:**

***PVC Trunking (casing capping):***

PVC Trunking (casing capping) ISI mark, 1.2 mm thick, minimum 20 mm width and above depending on No. of wires to be drawn (Refer Table No 1/3 for the size of trunking and number of wires to be drawn); with double locking arrangement, 1.8mm thick push-fit joints/accessories for PVC trunking such as couplers, elbows, internal / external angles, junction boxes of required ways of the same make.

***Hardware:***

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs, wooden gutties, etc.

**Method of Construction:**

**Erection of PVC Trunking for surface type wiring:**

Erection shall be done as per the final approved layout. The Trunking shall be in perfect level and plumb. Screws of minimum 35x8 mm and suitable plugs shall be used for fixing. In case of stonewalls wooden gutties shall be grouted in wall for fixing of screws of Trunking. Distance between 2 screws shall not be more than 600 mm. Size of Trunking shall be correct depending on number of wires to be drawn as per Table No 1/3 but not less than 20mm. Separate Trunking shall be used for each phase in single phase distribution and for power and light distribution and also for wiring of other utilities like data, telephone, TV cabling and distance of 300 mm shall be maintained between the Trunking or antielectrostatic partition to be provided. Double locking shall be checked while fixing capping. Adequate use of accessories shall be made at joints and at required locations.

**1.1.3 Rigid Steel Conduits**

**Specification No (WG-MA/CON)**

**Scope:**



### **Rigid Steel Conduits: Surface**

Providing specified Rigid Steel Conduits and erecting as per approved Method of Construction; on surface of wall / ceiling, etc including entries through walls / slabs / flooring as per requirement along with continuous earth wire, earth-clips and all necessary hardware, accessories; such as; spacers, saddles, Bends, Tees, Junction boxes, Checknuts, etc. and duly finishing, removing debris from site.

### **Material:**

#### ***Rigid Steel conduit:***

Rigid steel conduit minimum 20mm dia and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint including inspection type or normal accessories such as, 5mm thick 20mm width spacers and G.I. saddles for individual pipe or GI strip for bunch of pipe, sockets, open bends, junction boxes of required ways all of the same make.

#### ***Earth continuity wire:***

GI wire of 2.5 Sqmm; GI earth clips 22g, 10mm width, for fixing earth wire along the conduits.

### **Hardware:**

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC/ fill type plugs, wooden gutties, PVC/ rubber bushings etc.

### **Method of Construction:**

#### **Erection of Rigid steel Conduits:**

#### **General:**

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be duly screwed and firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5mm round headed for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers and saddles. Distance between 2 spacers shall not be more than 600mm.

Separate pipe shall be used for each phase in single phasedistribution and for power and light distribution. Also for wiring for other utilities like data,telephone, TV cabling distance between pipes shall not be less than 300 mm or antielectrostatic partition to be provided. Adequate use of conduit accessories shall be made atrequired locations. Entries in wall shall be at level of surface conduit with colour coding(For Visual identification) as per Table No 1/4. Flexible conduits shall be used at expansionjoints. Bushing shall be provided at open ends.

**Erection of Rigid steel Conduits:**

**Especially for Rigid Steel Conduit of surface type wiring**

In addition to general conditions above, Size of conduit shall be correct depending onnumber of wires to be drawn (as per Table No. 1/1 for steel conduits). All exposed threadedportion of Rigid Steel Conduits shall be painted with anti corrosive paint. Sharp edges at cutends shall be made smooth by removing burr. Inspection type conduits accessories shallbe used as per requirement in accessible position to facilitate drawing or withdrawing ofwires. All conduits piping work shall be properly Earthed with 2.5 sq. mm G.I Earth wirefixed to conduit and made continuous with Earth clips at every 1m and at ends and jointsviz. bends, junction boxes.

**Testing:**

**Earth continuity:**

Earth continuity shall be ensured at termination points of Earth wire, and between the endsof Rigid steel conduit.

**Polarity:**

Polarity test and should be done including confirmation of phase entry in switch only.

**Mode of Measurement:**

Measurement shall be carried out on the basis per running meter length of conduit /Trunking.

## **1.2 Conduits (Concealed type)**

### **Specification No (WG-MA/CC)**

#### **1.2.1 Concealing PVC Conduits in RCC work**

##### **Scope:**

Providing specified PVC conduit and laying / erecting in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with all required material including hardware, binding wire, fish wire; accessories such as deep / long neck PVC junction boxes, PVC / MS junction / draw-in boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages.

##### **Material:**

###### ***PVC Conduit:***

PVC pipe of minimum 20mm dia and above depending on No. of wires to be drawn (refer Table No.1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, deep Junction boxes of required ways and resin / adhesive to make all joints rigid.

###### ***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16g CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plates on it.

###### ***Hardware:***

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire, steel fish wire etc.

##### **Method of Construction:**

##### **Concealing of PVC conduits:**

##### **General:**

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in single phase distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All PVC conduit bending shall be done with Bending Spring. All joints shall be made rigid with resin.

### **Concealing of PVC conduits:**

#### **In RCC work:**

Work shall be commenced after fixing of steel re-enforcement on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers / sockets at ends and be flush with bottom of beam, and located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for drawing of wires later on.

### **1.2.2 Concealing PVC Conduits in walls / flooring**

#### **Scope:**

Providing specified PVC conduit and erecting / laying in wall, flooring by making chases / grooves / entries as per approved Method of Construction along with of all required material including hardware such as 'U' nails, binding wire, fish wire; accessories such as PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, glands, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site.

**Material:**

***PVC Conduit:***

PVC pipe minimum 20mm dia and above depending on No. of wires to be drawn (refer Table No.1/2), ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, Junction boxes of required ways, type and resin /adhesive to make all joints rigid.

***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16g CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plate on it.

***Hardware:***

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, steel fish wire, etc.

***Other material for Surface finishing:*** Cement, sand, putty, and water.

**Method of Construction:**

**Concealing of PVC conduits: (General)**

Work shall be done in co-ordination with civil work to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. for which the distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No.1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All bending of

conduits shall be done with Bending Spring. All joints shall be made rigid with resin.

**Concealing of PVC Conduits In walls / flooring:**

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories, and 'U' nails. All joints shall be made rigid with resin. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

**1.2.3 Rigid Steel Conduits in RCC work**

**Specification No (WG-MA/CC)**

**Scope:**

**Concealing of Rigid Steel Conduits:**

**In RCC work:**

Providing specified Rigid Steel conduit and laying / erecting in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with continuous earth wire and all required material including earth clips, hardware, binding wire, fish wire; accessories such as deep junction boxes, MS draw-in / junction / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages.

**Material:**

***Rigid Steel conduit:***

Rigid HG steel screwed conduit, minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as check nuts, long bends, deep junction boxes for slab, regular junction boxes for walls; of required ways, all of the same make.

***Earth continuity wire:***

GI wire of 2.5 sq. mm; GI earth clips 22g, 10mm width, for fixing earth wire along the conduits.

***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; fabricated from 16g CRCA sheet steel with earth terminal duly treated with anti-rust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix coverplate on it.

***Hardware:***

U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, fish wire, etc.

**Method of Construction:**

**Concealing of Rigid steel Conduits:**

**General:**

Work shall be done in co-ordination with civil work to suite final approved layout. Conduit shall be duly screwed and size of conduit shall be correct depending on number of wires to be drawn. (Table No.1/1, for Steel conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. for which distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For visual identification). Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done approved manner without changing the cross-section.

**In RCC work:**

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed with steel in slab by binding wire. Fixing

of conduits shall be possibly done with welding tags so that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers/ sockets at ends and be flush with bottom of beam, and located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through the conduits for drawing of wires later on.

#### **1.2.4 Rigid steel Conduits in walls / flooring**

##### **Specification No (WG-MA/CC)**

##### **Scope:**

##### **Concealing of Rigid steel Conduits:**

##### **In walls / flooring:**

Providing specified Rigid Steel Conduits and erecting in wall, flooring by making chases / grooves / entries as per approved Method of Construction along with continuous earth wire and all required material including earth clips hardware such as 'U' nails, binding wire, fishwire; accessories such as MS junction / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site.

##### **Material:**

##### ***Rigid Steel conduit:***

Rigid steel HG conduit minimum 20mm dia. and 16 gauge, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduit such as check nuts, long bends, deep junction boxes for flooring, regular junction boxes for walls; of required ways all of the same make.

##### ***Earth continuity wire:***



GI wire of 2.5 sq. mm, GI earth clips 22g, 10mm width, for fixing earth wire along the conduits.

**Junction boxes / Draw-in boxes:**

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plates on it.

**Hardware:**

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, GI fish wire, etc.

**Other material for Surface finishing:** Cement, sand, putty and water.

**Method of Construction:**

**Concealing of Rigid Steel Conduits:**

**General:**

Work shall be done in co-ordination with civil work to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No.1/1, for Steel conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc; for which the distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25 metre, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done approved manner without changing the cross-section.

**Concealing of Rigid Steel Conduits in walls/ flooring:**

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories, and hardware like 'U' nails, etc. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

**Testing:**

**Earth continuity:**

Earth continuity shall be ensured at termination point of Earth wire, between the ends of metal conduit.

**Mode of Measurement:**

Measurement shall be carried out on the basis per running meter length of conduit.

**1.3 Bunch of wires:**

**Specification No (WG-MA/BW)**

**Scope:**

**Bunch of wires:**

Providing specified wires and drawing them through provided conduits / trunking and / or as directed; with coded ferrules, harnessing the bunch of wires with necessary material when used in panel boards, duly connecting / terminating with lugs, and testing for safety and beneficial use.

**Material:**

***Wires: in conduits / trunking / panel boards***

***Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5.

***Wires: open***

***PVC insulated and PVC sheathed*** wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5.

***Earth Continuity Wire:***

PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5.

***Lugs:*** Copper lugs of appropriate size & type

***Other material:*** Rubber grommet, bush, harnessing material, flexible conduit etc.

**Method of Construction:**

**Bunch of wires:**

**Drawing of wires: General**

Specified wires shall be drawn with adequate care. Correct colour coding as per Table No.1/5, shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only, with appropriate type and size of lugs.

**Drawing of wires: through PVC conduits**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2.

**Drawing of wires: through Rigid Steel conduits**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1.

**Open Wire bunch:** Open wires shall be erected with due care so as to avoid chances of any mechanical injury. Harnessing shall be done with required material in an approved manner in panel boards or where ever necessary. For covering lead wires flexible conduit shall be used with gland as per necessity.

**Testing:**

**Insulation resistance test:**

All wiring shall be tested with 500V Meggar between phases, phase – neutral and to Earth. IR value shall not be less than 1M-ohm.

**Earth continuity:**

Earth continuity shall be ensured between termination points of Earth wire.

**Polarity Test:**

Test shall be carried out for ensuring the correct polarity in switch and plug.

**Mode of Measurement:**

Measurement shall be carried out on the basis per running meter length of single wire or bunch as specified.

**1.4 Mains (surface type)**

**1.4.1 Mains in surface PVC conduit**

**Specification No (WG-MA/PC)**

**Scope:**

**Mains in surface PVC conduit:**

Providing specified PVC Conduits, Wires and erecting the conduits as per approved Method of Construction; on surface of wall / ceiling, etc. including entries through walls / slabs / flooring as per requirement, and with all necessary hardware, accessories such as Spacers, Saddles, Bends, Tees, Junction boxes, Check-nuts / glands, etc.; making conduits erection work rigid; and drawing the specified wires through these conduits and duly connecting / terminating with lugs, complete finishing, removing debris from site testing for safety and beneficial use.

**Material:**

***PVC Conduit:***

PVC pipe of minimum 20mm dia and above depending on No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or noninspection type Elbows, Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

***Hardware:***

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs, wooden gutties, etc.

***Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires)***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of appropriate colour coding as per Table No 1/5

***Earth Continuity Wire:***

PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green or green yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5

***Lugs:*** Copper lugs of appropriate type and size.

**Other material:** Rubber grommet, bush, flexible PVC conduit, gland etc.

### **Method of Construction:**

#### **Erection PVC Conduits for Surface type wiring:**

##### **General:**

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5 mm, roundheaded screws for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers. Distance between 2 spacers shall not be more than 600 mm. Size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/2 for PVC conduits). Separate pipe shall be used for each phase in 1-phase distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300 mm or antielectrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface conduit with colour coding (For Visual identification) as per Table No. 1/4. Flexible conduits shall be used at expansion joints.

##### **Especially for PVC Conduits of surface type wiring:**

In addition to general instructions above, all joints shall be made rigid with resin / adhesive. Wherever offsets are necessary, it shall be done with bending spring. Size of conduit shall be as per Table No. 1/2 for number of wires to be drawn through the conduit.

##### **Drawing of wires: General**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5, shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with appropriate type and size of lugs.

**Drawing of wires: through PVC conduits for surface type wiring**

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as perspecified shall be drawn through conduit. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2. At the termination end flexible PVC conduit shall be used with gland as per required.

**1.4.2 Mains in PVC Trunking (casing capping)**

**Specification No (WG-MA/PC)**

**Scope:**

**Surface type Mains in PVC Trunking (casing capping)**

Providing specified PVC Trunking, Wires and erecting the Trunking as per approved Method of Construction; on surface of wall / ceiling, etc. including entries made with PVC conduit through walls / slabs / flooring as per requirement with all necessary hardware, accessories such as inner / outer Elbows, Tees, Junction boxes, etc; including erection of specified wires in PVC trunking, with coded ferrules and duly connecting with lugs, and finishing, removing debris from site; testing for safety and beneficial use.

**Material:**

***PVC Trunking:***

PVC Trunking (casing capping) ISI mark, 1.2 mm thick, minimum 20 mm width and above depending on No. of wires to be drawn (Refer Table No 1/2 for the size of trunking and number of wires to be drawn); with double locking arrangement, 1.8mm thick push-fit joints/accessories for PVC trunking such as couplers, elbows, internal / external angles, junction boxes of required ways of the same make.

***Hardware:***

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC/ fill type plugs, wooden gutties, etc.

***Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires)***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

**Earth Continuity Wire:** PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green colour, ISI marked, of specified size but not less than 1.5 Sqmm as per Table No 1/5

**Lugs:** Copper lugs of appropriate type and size.

**Other material:** Flexible PVC conduit, gland coded ferrules, etc.

### **Method of Construction:**

#### **Erection of PVC Trunking for surface type wiring**

Erection shall be done as per the final approved layout. The Trunking shall be in perfect level and plumb. Screws of minimum 35x8 mm and suitable plugs shall be used for fixing. In case of unlevelled surface number and size of screws shall be changed to higher size as per requirement and in case of stonewalls wooden gutties shall be grouted in wall for fixing of screws of Trunking. Distance between 2 screws shall not be more than 600 mm. Size of Trunking shall be correct depending on number of wires to be drawn as per Table No 1/3 but not less than 20mm. Separate Trunking shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring of other utilities like data, telephone, TV cabling and distance of 300 mm shall be maintained between the Trunking or anti electrostatic partition is to be provided. Double locking shall be checked while fixing capping. Adequate use of accessories shall be made at joints and required locations.

#### **Erecting wires in Trunking:**

Wires shall be erected within Trunking with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be erected in single Trunking. Wires shall be terminated in the terminals of accessories only, with appropriate type and size of lugs. Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be erected



through Trunking. Number of wires shall not exceed with respect to size of Trunking as per Table No. 1/3. After erection of wires double locking shall be checked while fixing capping. At the termination end flexible PVC conduit shall be used with gland as per required.

### **1.4.3 Mains in Rigid steel conduit (Surface type)**

#### **Specification No (WG-MA/MC)**

#### **Scope:**

#### **Surface type Mains in Rigid steel conduit:**

Providing specified Rigid Steel Conduits and erecting as per approved Method of Construction; on surface of wall / ceiling, etc including entries through walls / slabs / flooring as per requirement along with continuous earth wire, earth-clips and all necessary hardware, accessories; such as; spacers, saddles, Bends, Tees, Junction boxes, Checknuts, etc; and drawing the specified wires through these conduits in approved manner; with coded ferrules and duly connecting with lugs, and duly finishing, removing debris from site; testing the installation for safety and beneficial use.

#### **Material:**

#### ***Rigid Steel conduit:***

Rigid steel HG screwed conduit minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as 5 mm thick 20mm width spacers and G.I. saddles, sockets, open bends, junction boxes of required ways all of the same make.

#### ***Earth continuity wire:***

GI wire of 2.5 sq. mm GI earth clips 22g, 10mm width, for fixing earth wire along the conduits.

#### ***Hardware:***

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC / fill type plugs, wooden gutties, PVC / rubber bushings etc.

**Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):** PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

**Earth Continuity Wire:**

PVC insulated wire minimum FR grade insulation copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5

**Lugs:** Copper lugs of appropriate size & type

**Other material:** Rubber Bush, Flexible metal conduit, gland etc.

**Method of Construction:**

**Erection of Rigid Steel Conduits:**

**General:**

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be duly screwed and firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5mm round headed for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers and saddles. Distance between 2 spacers shall not be more than 600mm. Size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/1 for steel conduits). Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface conduit with colour coding (For Visual identification) as per Table No 1/4. Flexible conduits shall be used at expansion joints. Bushing shall be provided at open ends.

**Erection of rigid steel Conduits:**

**Specially for Rigid Steel Conduit of surface type wiring:**

In addition to general conditions above, Size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/1 for steel conduits). All exposed threaded portion of Rigid Steel Conduits shall be painted with anti corrosive paint. Sharp edges and burr at cut ends shall be made smooth. Inspection type conduits accessories shall be used as per requirement in accessible position to facilitate drawing or withdrawing of wires. All conduits, piping work shall be properly earthed with 2.5 Sqmm G.I Earth wire duly fixed to conduit and made continuous with Earth clips at every 1m and at ends and joints viz. bends, junction boxes.

**Drawing of wires:**

**General:**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

**Drawing of wires:**

**Through Rigid Steel conduits for surface type wiring:**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1. At the termination end flexible metal conduit shall be used with gland.

**Testing:**

**Insulation resistance test:**

All wiring shall be tested with 500V Meggar between phases, phase – neutral and to Earth. IR value shall not be less than 1M-ohm.

**Earth continuity:**

Earth continuity shall be ensured at all earth terminals and at earth terminals of metalenclosures.

**Polarity test:**

Polarity test shall be carried out for ensuring polarity in switch and plug.

**Mode of Measurement:**

Measurement shall be carried out on the basis per running meter of pipe length.

**1.5 Mains (Concealed type)**

**1.5.1 Mains in PVC Conduits in RCC work**

**Specification No (WG-MA/CC, WG-MA/BW)**

**Scope:**

**Concealed Mains in PVC Conduits in RCC work:**

Providing specified PVC conduit, wires and laying / erecting Conduits in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with of all required material including hardware, binding wire, fish wire; accessories such as deep PVC junction boxes, PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages and as and when directed drawing of specified wires through these conduits with fish wire, tagging with coded ferrules and duly connecting with lugs, complete testing the installation for safety and beneficial use.

**Material:**

**PVC Conduit:**

PVC pipe of minimum 20mm dia and above, depending on number of wires to be drawn (refer Table No 1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, deep Junction boxes of required ways and resin / adhesive to make all joints rigid.

***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plates on it.

***Hardware:***

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, GI fish wire, etc.

***Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

***Earth Continuity Wire:*** PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 1.5 Sqmm as per Table No 1/5

***Lugs:*** Copper lugs of required size & type

***Other material:*** Rubber grommet, bush, harnessing material, flexible conduit etc.

***Method of Construction:***

***Concealing of PVC conduits:***

***General:***

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti

electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All PVC conduit bending shall be done with Bending Spring. All joints shall be made rigid with resin.

### **Concealing of PVC conduits:**

#### **In RCC work:**

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers / sockets at ends and be flush with bottom of beam, and at located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for drawing of wires later on.

### **Drawing of wires:**

#### **General:**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with appropriate type and size of lugs.

### **Drawing of wires:**

#### **Through PVC conduits:**

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as perspecified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2.

### **1.5.2 Concealed Mains in PVC Conduits in walls / flooring:**

#### **Specification No (WG-MA/CC)**

#### **Scope:**

#### **Concealed Mains in PVC Conduits in walls / flooring:**

Providing specified PVC conduit, Wires and laying / erecting the conduits in wall, flooring by making chases / grooves / entries as per approved Method of Construction along with of all required material including hardware such as 'U' nails, binding wire, fish wire; accessories such as PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site and as and when directed drawing of specified wires through these conduits with fish help of wire, tagging by coded ferrules and duly connecting / terminating with lugs, complete testing the installation for safety and beneficial use.

#### **Material:**

#### **PVC Conduit:**

PVC pipe minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2, ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; Couplers, long Bends, Junction boxes of required ways and resin / adhesive to make all joints rigid.

#### **Junction boxes / Draw-in boxes:**

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; PVC or fabricated from 16g CRCA sheet steel with earth terminal duly treated with antirust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plate on it.

#### **Hardware:**

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steelbinding wire 20g, steel fish wire, etc.

**Other material for Surface finishing:** Cement, sand, putty and water.

**Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):**

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic tough pitch (ETP) grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

**Earth Continuity Wire:** PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5

**Lugs:** Copper lugs of appropriate size & type

**Other material for wire drawing:** Rubber grommet, bush, harnessing material, flexible conduit etc.

**Method of Construction:**

**Concealing of PVC conduits:**

**General:**

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner



so as to facilitate drawing of wires. All bending of conduits shall be done with Bending Spring. All joints shall be made rigid with resin.

**Concealing of PVC Conduits In walls / flooring:**

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories, and 'U' nails. All joints shall be made rigid with resin. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

**Drawing of wires:**

**General:**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

**Drawing of wires:**

**Through PVC conduits:**

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as specified shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/2. At the termination end flexible PVC conduit shall be used with gland as per necessity.

**1.5.3 Concealed Mains in Rigid Steel Conduits in RCC work**

**Specification No (WG-MA/CC, WG-MA/BW)**

**Scope:**

**Concealed Mains in Rigid Steel Conduits in RCC work:**

Providing specified PVC conduit, Wires and laying / erecting the conduits in RCC work, such as slab, beam, column before casting as per approved Method of Construction along with continuous earth wire and all required material including earth clips, hardware, binding wire, fish wire; accessories such as deep PVC junction boxes, PVC / MS junction boxes / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, removing debris from site and supervising the work during casting to confirm rigidity, continuity and avoid damages and as and when directed drawing of wires through these conduits with fish wire, ferruling by coding tags and duly connecting with lugs, complete testing the installation for safety and beneficial use.

**Material:**

***Rigid Steel conduit:***

Rigid HG steel screwed conduit minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as check nuts, long bends, deep junction boxes for slab, regular junction boxes for walls; of required ways all of the same make.

***Earth Continuity wire:***

GI wire of 2.5 sq. mm 22g 10mm width, GI earth clips for fixing earth wire along with the conduits.

***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with anti-rust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plates on it.

***Hardware:***

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, steel fish wire, rubber / PVC bushes etc.

***Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

***Earth Wire:*** PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per Table No 1/5

***Lugs:*** Copper lugs of required size & type.

***Other material:*** Rubber grommet, bush, harnessing material, flexible conduit etc.

**Method of Construction:**

**Concealed Mains in Rigid Steel Conduits in RCC work:**

**Concealing of conduits:**

**General:**

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No 1/1, for Steel conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the final approved layout, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25 m, in such a manner so as to facilitate drawing of wires. All bending of conduits shall be done in approved manner without changing the cross-section.

**Concealing of conduits:**

**In RCC work:**

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed with steel in slab by binding wire. Fixing of conduits shall be possibly done with welding tags so that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers/ sockets at ends and be flush with bottom of beam, and located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through the conduits for drawing of wires later on.

**Drawing of wires:**

**General:**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

**Drawing of wires:**

**Through Rigid Steel conduits:**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1

**1.5.4 Mains in Rigid steel Conduits in walls / flooring**

**Specification No (WG-MA/CC, WG-MA/BW)**

**Scope:**

**Concealed Mains in Rigid Steel Conduits in walls / flooring:**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Providing specified Metal conduit, Wires and erecting in wall, flooring by making chases /grooves / entries as per approved Method of Construction along with continuous earth wire and all required material including earth clips hardware such as 'U' nails, binding wire, fishwire; accessories such as MS junction / inspection boxes, check-nuts, flexible PVC pipe, drawing fish-wires and making all piping rigid, refinishing the surface with cement mortar, removing debris from site and as and when directed drawing of wires through these conduits with fish wire, ferruling by coding tags and duly connecting with lugs, completing testing the installation for safety and beneficial use.

### **Material:**

#### ***Rigid Steel conduit:***

Rigid HG steel screwed conduit minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as check nuts, long bends, deep junction boxes for flooring, regular junction boxes for walls; of required ways all of the same make.

***Earth continuity wire:*** GI wire of 2.5 sq. mm 22g 10mm width, GI earth clips for fixing earth wire along with the conduits.

#### ***Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate and of suitable size to accommodate No. of entries; fabricated from 16 SWG CRCA sheet steel with earth terminal duly treated with anti-rust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix cover plates on it.

#### ***Hardware:***

'U' nails, plumbing and general use nails of required sizes, washers, check-nuts, steel binding wire 20g, steel fish wire, rubber, PVC bushes etc.

***Other material for Surface finishing;*** Cement, sand, putty and water.

***Wires: Mains / Sub-mains / Circuit mains (comprising phase and neutral wires):***

PVC insulated wire of specified size, minimum FR grade insulation, copper conductor of electrolytic grade, having insulation of 1.1 kV grade, ISI marked, of required colour coding as per Table No 1/5

***Earth Continuity Wire:*** PVC insulated wire minimum FR grade insulation copper conductor of electrolytic grade, having insulation of 1.1 kV grade, of green / green-yellow colour, ISI marked, of specified size but not less than 2.5 Sqmm as per **Table No 1/5**.

***Lugs:*** Copper lugs of appropriate size & type

***Other material:*** Rubber grommet, bush, harnessing material, flexible conduit etc.

**Method of Construction:**

**Concealed Mains in Metal Conduits in walls / flooring Concealing of conduits:**

**General:**

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No 1/1, for Steel conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with colour coding as per Table No. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done approved manner without changing the cross-section.

**Concealing of Conduits in walls/ flooring:**

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the wall surface shall be done. Work in flooring shall not disturb RCC work, Conduits of adequate size shall be erected with use of appropriate accessories and hardware like 'U' nails, etc. Draw-in / inspection boxes shall be fixed with check-nut, flush with surrounding surface and earthed.

### **Drawing of wires:**

#### **General:**

Wires shall be drawn with adequate care. Correct colour coding as per Table No. 1/5, shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped only within circuit. For lighting load or single-phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of lugs.

### **Drawing of wires:**

#### **Through Rigid Steel conduits:**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1. At the termination end flexible metal conduit shall be used with glands as per necessity.

### **Testing:**

#### **Insulation resistance test:**

All wiring shall be tested with 500V Meggar between phases, phase – neutral and to Earth. IR value shall not be less than 1M-ohm.

#### **Earth continuity:**

Earth continuity shall be ensured at all earth terminals and at earth terminals of metal enclosures.

#### **Polarity Test:**

Polarity test shall be carried out for ensuring correct polarity in plug and switch.

**Mode of Measurement:**

Measurement shall be carried out on the basis per running meter of pipe length.

**1.6 Point wiring (Surface type)**

**Specification No (WG-PW/SW)**

**Scope:**

**Point wiring (Surface type):**

Providing all required approved specified material including hardware and erecting wiring on surface of wall, ceiling from switch board to outlet for light / fan / bell / independent plug point, in rigid steel / PVC conduit or PVC trunking as specified; fixing one board with a 1way switch for one way point or two boards with a 2 way switch on each board, in case of 2way point; for controlling power supply and one board / block with accessory for outlet of light / fan / plug and terminating wires within as per approved Method of Construction; removing all debris and testing the installation for safety and beneficial use.

**Material:**

**Point wiring (Surface)**

**PVC conduit:**

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1/2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, inspection or noninspection type Elbows, Tees, Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

**PVC Trunking:**

PVC Trunking (casing capping) ISI mark, 1.2 mm thick, minimum 20 mm width and above depending on No. of wires to be drawn (Refer Table No 1/2 for the size of trunking and number of wires to be drawn); with double locking arrangement, 1.8 mm thick push-fit joints/ accessories for PVC trunking such as



couplers, elbows, internal / external angles, junctionboxes of required ways of the same make.

***Rigid Steel conduit:***

Rigid steel screwed conduit minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No. 1/1, 16 gauge, ISI mark, ERW grade duly processed for antirusttreatment and painted with black enamel paint, accessories for rigid steel conduitssuch as 5mm thick 20mm width spacers and G.I. saddles for individual pipe or GI strip forbunch of pipes, sockets, inspection type or normal; open bends, junction boxes of requiredways all of the same make.

***Wires: Phase and Neutral***

PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytictough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No1/5

***Earth Wire:***

PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of1.1 kV grade, of green / green-yellow colour, ISI marked, 2.5 Sqmm or bare copper wire of14g

***Accessories:***

***Switch:*** 1 or 2 way Piano type 6/10 A, 1 or 2 way Modular type switch 6/10A.

***Outlet:*** 6A angle / batten lamp holder or 3 plate ceiling-rose or Bakelite / porcelain

three way connector or if plug point, 6A, 3-pin plug socket.

***Boards:***

Switchboards shall be double walled (back and front) of suitable size, to accommodateindependent slot for each switch, socket, fan regulator. Boards shall be made up of 4mmthick marine grade plywood for back and front fixed on wooden frame with 0.8mm thicklaminare pasted on exposed portion of front ply, totally varnished and with either brasshinged door or screwed top.

**Or**

As above with 3mm thick Bakelite/Hylam top instead of laminated front ply.

**Or**

Board made from Filled polypropylene.Round/Square double wooden block or PVC board for mounting light / fan outlet accessory.

**Hardware:**

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC/ fill type plugs, wooden gutties, PVC/ rubber bushings etc.

**Method of Construction:**

**Point wiring (Surface)**

**Erection of conduits:**

**General:**

Erection shall be done as per the final approved layout, in perfect level and plumb. Conduits shall be duly screwed and firmly fixed on spacers with saddles. Fixing of spacers shall be equidistant and at ends, bends, elbows, junction boxes, couplings, boards. CSK screws of minimum 35x8 mm and suitable plugs shall be used for fixing spacers and 12x5mm round headed for fixing saddles on spacers. In case of stonewalls wooden gutties shall be grouted in wall for fixing of spacers and saddles. Distance between 2 spacers shall not be more than 600mm. Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution. Also for wiring for other utilities like data, telephone, TV cabling distance between pipes shall not be less than 300 mm. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of surface conduit with colour coding (For Visual identification) as per Table No 1/4. Flexible conduits shall be used at expansion joints. Bushing shall be provided at open ends.

**Erection of conduits:**

**PVC pipes for surface type wiring:**

In addition to General conditions above, all joints shall be made rigid with resin / adhesive. Wherever offsets are necessary, same shall be done with bending

spring. Size of conduit shall be correct depending on number of wires to be drawn as per Table No. 1/2.

**Or**

**Specially for Rigid Steel Conduit of surface type wiring:**

In addition to general conditions above, Size of conduit shall be correct depending on number of wires to be drawn (as per Table No. 1/1 for steel conduits). All exposed threaded portion of Rigid Steel Conduits shall be painted with anti corrosive paint. Sharp edges and burr at cut ends shall be made smooth. Inspection type conduits accessories shall be used as per requirement in accessible position to facilitate drawing or withdrawing of wires. All conduits piping work shall be properly earthed with 2.5 sq. mm G.I Earth wire fixed to conduit and made continuous with Earth clips at every 1m and at ends and joints viz. bends, junction boxes.

**Or**

**Erection of PVC Trunking for surface type wiring:**

Erection shall be done as per the final approved layout. The Trunking shall be in perfect level and plumb. Screws of minimum 35x8 mm and suitable plugs shall be used for fixing. In case of unlevelled surface number and size of screws shall be changed to higher size as per requirement and in case of stonewalls wooden gutties shall be grouted in wall for fixing of screws of Trunking. Distance between 2 screws shall not be more than 600 mm. Size of Trunking shall be correct depending on number of wires to be drawn as per Table No 1/3 but not less than 20mm. Separate Trunking shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring of other utilities like data, telephone, TV cabling and distance of 300 mm shall be maintained between the Trunking. Double locking shall be checked while fixing capping. Adequate use of accessories shall be made at joints and required locations.

**Drawing of wires: General**

Wires shall be drawn with adequate care. Correct colour coding as per Table No 1/5 shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit. For lighting load distribution wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm or as per specified shall be erected wherever

necessary. In case of 2-way point wiring additional wires of phaseconductor shall be provided between the 2-way switches.

**Drawing of wires: through PVC conduits for surface type wiring**

Insulated Earth wire of green or green-yellow colour of minimum 2.5 sq mm shall be drawn through pipe. Number of wires shall not exceed with respect to size of pipe as per TableNo. 1/2.

**Or**

**Drawing of wires: through Rigid Steel conduits for surface type wiring**

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs / sharp edges. Number of wires shall not exceed with respect to size of pipe as per Table No. 1/1.

**Or**

**Erecting wires in Trunking:**

Wires shall be erected within Trunking with adequate care. Number of wires shall not exceed with respect to size of Trunking as per Table No. 1/3. After erection of wires doublelocking shall be checked while fixing capping.

**Fixing Switchboards and accessories:**

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. (and more as per size of board) of screws of length not less than 50mm, termination of wires shall be done with lugs on switch and other accessories only by carefully inserting all strands in lugs, terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches and for earthing inside switchboards. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured.

**Testing:**

**Insulation resistance test:**

All wiring shall be tested with 500V Meggar between phases, phase – neutral and to Earth. IR value shall not be less than 1M-ohm.

**Earth continuity:**

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

**Polarity test:**

Polarity test shall be carried out for ensuring the correct polarity in switch and plug.

**Mode of Measurement:**

Measurement shall be carried out on the basis per number of points, **for the point length up to 6 meter between switch and outlet**. For the length exceeding 6 meter 10% of overall rate shall be added for every 1m.

**1.7 Point wiring (Concealed type)**

**Specification No (WG-PW/CW)**

**Scope:**

**Point wiring (Concealed type):**

Providing all required approved specified material including hardware and erecting rigid steel / PVC conduits, junction boxes, provided fan boxes, along with required accessories in RCC slabs before casting and in walls, flooring by making chases, and refilling the same after erection of conduits, fixing concealed type boxes for switch boards in walls, drawing wires through conduits, from switch board to outlet for light / fan / bell / independent plug point fixing modular type switch for controlling power supply and an accessory for outlet of light / fan / bell / plug at other end, with mounting plate, and terminating wires within at both ends, as per approved Method of Construction, closing all junction boxes with plates; removing all debris and testing the installation for safety and beneficial use.

**Material:**

**Point wiring (Concealed):**

***PVC conduit:***

PVC pipe of minimum 20mm dia and above depending No. of wires to be drawn (refer Table No 1 / 2); ISI mark, HMS grade (2mm thick), accessories for PVC pipes of the same make that of pipe; such as Spacers & Saddles, Couplers, Bends, deep / normal Junction boxes of required ways and resin / adhesive to make all joints rigid. Black pipe shall not be used for surface type wiring.

***Rigid Steel conduit:***

Rigid steel screwed conduit minimum 20mm dia. and higher depending on No. of wires to be drawn as per Table No.1/1, 16 gauge, ISI mark, ERW grade duly processed for anti-rust treatment and painted with black enamel paint, accessories for rigid steel conduits such as sockets, bends, deep / normal junction boxes of required ways all of the same make.

***Sheet metal Junction boxes / Draw-in boxes:***

Junction box shall be 5 sided with removable top plate, fabricated from 16g CRCA sheet steel with earth terminal duly treated with anti-rust treatment and painted with two coats of red oxide paint. There shall be knockout holes in required numbers and dia. for entry of conduit pipes and arrangement to fix surface cover plate on it. Cover plate shall be made up of fire resistant PVC material / 3mm thick laminate / Bakelite / Hylam / transparent acrylic sheet painted from inside to match colour of wall with duly tapered edges.

***Wires: phase and neutral wires***

PVC insulated wires of specified size, 1.1 kV, & minimum FR grade insulation, electrolytic tough pitch (ETP) copper conductor, ISI marked, of required colour coding as per Table No 1/5

***Earth Continuity Wire:***

PVC insulated minimum FR grade copper wires of electrolytic grade, having insulation of 1.1 kV grade, of green colour, ISI marked, 2.5 Sqmm or bare copper wire of 14g

**Lugs:** Pin type Copper lugs.

**Accessories:**

**Switch:** 1 or 2 way Modular type switch 6/10A.

**Outlet:**

Modular type 6A angle / batten lamp holder or 3 plate ceiling-rose or Bakelite / porcelain 3 way connector or if plug point, 6A, 3-pin plug shuttered socket.

**Boards:**

Switchboards shall comprise of; concealed type box of required modules made of sheetmetal or Polypropylene material, mounting plate and cover plate. The required modules shall be worked out on the basis of points, plug socket/sockets, step type fan regulator, etcare to be fixed. For every blank module, 1 way blank plate shall be fixed. All the above accessories shall be of same make, as that of switch.

**Hardware:**

Sheet Metal (SM) screws of sizes specified in Method of Construction, washers, rawl / PVC/ fill type plugs / wooden gutties, 'U' nails, plumbing nails, steel binding wire, fish wire 20g, rubber / PVC bushes etc.

**Other material for Surface finishing:** Sand, Cement, water etc.

**Method of Construction:**

**Point wiring (Concealed):**

**Concealing of conduits:**

**General:**

Work shall be done in co-ordination with civil work and to suite final approved layout. Size of conduit shall be correct depending on number of wires to be drawn. (Table No. 1/1 for Steel conduits & Table No 1/2 for PVC conduits) Separate pipe shall be used for each phase in 1-ph distribution and for power and light distribution and also for wiring for other utilities like data, telephone, TV cabling, etc. The distance between pipes shall not be less than 300 mm. Adequate use of conduit accessories shall be made at required locations. Entries

in wall shall be at level of corresponding conduit with colour coding as per TableNo. 1/4. (For Visual identification) Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 4.25m, in such manner so as to facilitate drawing of wires. All the bends shall be done with Bending Spring.

### **Concealing of conduits: In RCC work**

Work shall be commenced after fixing of steel (re-enforcement) on centering material. Conduits shall be firmly fixed on steel of RCC work by binding wire. Fixing of conduits shall be such that it will remain rigid during casting of slab, beam, and column even after use of vibrator. Deep junction boxes and other draw-in boxes shall be such that their open end and centering material will not have gap in between so as to avoid concrete entering inside even after fixing covers to steel re-enforcement; and be filled with dry sand. Open ends of conduits; to be concealed in walls, shall be provided with couplers / sockets at ends and be flush with bottom of beam, and at located at the center of the beam. As far as possible bunching / grouping of conduits shall be avoided so that it will not affect strength of RCC work especially in beams. Suitable steel fish wire shall be drawn through in the conduits for drawing of wires later on.

### **Concealing of Conduits: In walls**

Chases shall be made in walls of adequate width, with cutter and chiseling through it. Necessary finishing of the surface shall be done. Conduits of adequate size shall be erected with use of appropriate accessories and 'U' nails.

### **Drawing of wires:**

Use of Steel fish wire shall be made for drawing of wires. Wires shall be drawn with adequate care. Correct colour coding shall be used for phase, neutral and earth. Wire shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral) may be looped within circuit only. For lighting load distribution, wires of two different phases shall not be drawn in single pipe. Wires shall be terminated in the terminals of accessories only. Adequate extra length shall be left at termination points. In case of 2-way point wiring additional wires of phase conductor shall be provided between the 2-way switches.



### **Fixing Switchboards and accessories:**

Control switchboards shall generally be erected at 1.35m height or as specified and fixed with minimum 2 Nos. of screws of length not less than 50 x 8mm, Boards shall be in line and plumb and shall be in level with wall surface so as to fix mounting plate flush with wall, Termination of wires shall be done in switch and other accessories only by carefully inserting all strands in terminals and proper tightening. Switches shall be provided on phase wire only. Bare wire shall not be used for looping incoming supply to switches. Phase wire shall be routed through switch only. For plug socket phase wire shall be connected in right side terminal when seen from front. Proper termination of earth wire in Earth terminal shall be ensured. All blank modules shall be plugged with blanking plates.

### **Testing:**

#### **Insulation resistance test:**

All wiring shall be tested with 500V Meggar between phases, phase – neutral and to Earth. IR value shall not be less than 1M-ohm.

#### **Earth continuity:**

Earth continuity shall be ensured at all earth terminals of plug outlets and at earth terminals of metal enclosures.

#### **Polarity test:**

Polarity test shall be carried out for ensuring the correct polarity in the plug.

#### **Mode of Measurement:**

Measurement shall be carried out on the basis per number of points, **for the point length up to 6 metre between switch and outlet.** For the length exceeding 6 metre 10% of overall rate shall be added for every 1 metre.

## **2. DISMANTLING POINT WIRING: (WG-PW/DM)**

Electrical installation of point wiring along with circuit mains from DBs shall be dismantled with adequate care without damaging surface of wall, ceiling, and flooring. The holes shall be refinished to match with the surrounding surface. Site

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shall be made clean by removing debris. Dismantled material shall be retained by the agency.

### 3. Mode of Measurement:

Executed quantity will be counted on the basis of number of points. (i.e. per Point)

**Table No. 1/1**

<b>Size of cable mm<sup>2</sup></b>		<b>Size of conduit mm</b>													
<b>Nominal Cross sectional area</b>	<b>No. and dia. of wires</b>	16		20		25		32		40		50		63	
		S	B	S	B	S	B	S	B	S	B	S	B	S	B
1.0	1 / 1.12 Cu	5	4	7	5	13	10	20	14						
1.5	1 / 1.4	4	3	7	5	12	10	20	14						
2.5	1 / 1.8 3 / 1.06 Cu	3	2	0	5	10	8	18	12						
4.0	1 / 2.24 7 / 0.85 Cu	3	2	4	3	7	8	12	10						
6	1 / 2.80 7 / 1.06 Cu	2		3	2	6	5	10	8						
10	11 / 3.55 Al 7 / 1.40 Cu			2		5	4	8	7						
				2		4	3	6	5						
16	7 / 1.70					2		4	3	7	6				
25	7 / 2.24							3	2	5	4	8	6	9	7
35	7 / 2.50							2		4	3	7	5	8	6
50	7 / 3.0 Al 19 / 1.80									2		5	4	6	5

**Note 1:** Cu- applicable to only copper cable; Al- applicable to only Aluminum

#### Cable

**Note 2:** The table shows maximum capacity of conduits for the simultaneous drawing of cables. The columns headed 'S' apply to straight runs of conduits

which have distance not exceeding 4.25m between draw in boxes and which do not deflect from straight by an angle more than 150. The columns headed 'B' apply to bent runs of conduit, which deflect from the straight by an angle of more than 150.

**Note 3:** In case of inspection type draw in box has been provided and if the cable is first drawn through one straight conduit, then through the draw in box and then through the second straight conduit such system may be considered as that of straight conduit even if the conduit deflects through the straight by more than 150.

**Table No. 1/2**

**Maximum Number of Single Core 1.1 kV Cables That Can Be Drawn In Rigid Non-Metallic Conduits**

<i>Size of cable mm<sup>2</sup></i>		<i>Size of conduit mm</i>					
<i>Nominal Cross sectional area</i>	<i>No. and dia. of wires</i>	16	20	25	32	40	50
1.0	1 / 1.12 Cu	5	7	13	20		
1.5	1 / 1.4	4	6	10	14		
2.5	1 / 1.8 3 / 1.06 Cu	3	5	10	14		
4.0	1 / 2.24 7 / 0.85 Cu	2	3	6	10	14	
6	1 / 2.80 7 / 1.06 Cu		2	5	9	11	
10	11 / 3.55 Al 7 / 1.40 Cu			4	7	9	
16	7 / 1.70			2	4	5	12
25	7 / 2.24				2	2	6
35	7 / 2.50					2	5
50	7 / 3.0 Al 19 / 1.80					2 2	5 3

**Note 1:** Cu- applicable to only copper cable; Al- applicable to only Aluminium cable

**Table No. 1/3**

**Maximum Number of Single Core 1.1 kV Cables in Cable Trunking (Casing and Capping)**

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

<b>Size of cable mm<sup>2</sup></b>		<b>Size of Trunking mm</b>				
<b>Nominal Cross sectional area</b>	<b>12/16 x 12 mm</b>	<b>20 x 12 mm</b>	<b>25 x 12 mm</b>	<b>32 x 12 mm</b>	<b>40 x 20 mm</b>	<b>50 x 20 mm</b>
<b>1.0</b>						
<b>1.5</b>	3	5	6	8	12	18
<b>2.5</b>	2	4	5	6	9	15
<b>4.0</b>	2	3	4	5	8	12
<b>6</b>		2	3	4	6	9
<b>10</b>		1	2	3	5	8
<b>16</b>			1	2	4	6
<b>25</b>				1	3	5
<b>35</b>					2	4
<b>50</b>					1	3

**Note 1: Cu- applicable to only copper cable; Al- applicable to only Aluminum cable**

**Table No. 1/4**

<b>Conduit for</b>	<b>Colour</b>
<b>Light / Power circuit</b>	Black
<b>Security wiring</b>	Blue
<b>Fire Alarm wiring</b>	Red
<b>Low voltage circuits</b>	Brown
<b>UPS circuits</b>	Green

**Table No 1/5**

<b>Type</b>	<b>Colour</b>
<b>Phase</b>	Red, Yellow, Blue
<b>Neutral</b>	Black
<b>Earth</b>	Green

**Colour Coding For Conduits in Wall Entry Colour Code for Wires**

**1.11 Telephone wiring (TW)**

**1. General**

All material shall conform to relevant standard as per BIS and shall carry ISI mark. If any particular category of material for which ISI mark is not available in market, it shall be approved either by ITD **I** DOT of Govt. of India. Work shall be carried out as per the Method of Construction specified by BIS and as specified by DOT (Department of Telephone), Govt. of India.

Material and Work not qualifying to any provision mentioned above shall be to the

satisfaction of Engineer in Charge.

## **2. Scope:**

### **Specification No (WG-TW)**

To provide wiring for telephone on surface of wall or ceiling concealed in slab, wall, under flooring, etc, through existing metallic conduits, rigid PVC conduits, PVC trunking, with all necessary hardware, material, etc. as specified. To provide, install, test & commission the instruments / equipments and accessories used in telephone system, such as; Main Distribution Frames (MDF), Krone Modules, OverVoltage Magazine, PBX / EPABX, CO-axial cable, Rosette box, Jumper wire, etc.

## **3. Material:**

**PVC Telephone cable:** PVC insulated Tinned copper solid conductor with minimum 0.5mm dia. (Single & Multi pair) properly paired and colour coded, shall be terminated on KRONE module with suitable tool.

**Jelly filled Armoured Telephone cable:** PVC insulated, PVC sheathed with steel armouring, Tinned copper solid conductor with minimum 0.5 mm dia multi pair, with Jelly, properly paired and colour coded.

**Saddles:** Saddles fabricated from G I sheet of required gauge (16/18 gauge) either galvanized finish or painted with superior quality enamel black paint, with necessary shearing for mechanical strength, semi circular shaped with extended piece having suitable holes for fixing on spacer.

**Hardware:** Sheet Metal (SM) screws of required sizes, plugs, wooden gutties, etc.

**MDF:** Manufactured by reputed manufacturer of specified capacity, facility for wallmounting, with door & lock, aluminium frame for fixing of KRONE, duly enclosed in cabinet made from 18 SWG CRCA sheet with powder coating of required colour.

**Light / Power circuit** Black

**Security wiring** Blue

**Fire Alarm wiring** Red

**Low voltage circuits** Brown

**UPS circuits** Green

**Phase** Red, Yellow, Blue

**Neutral** Black

**Earth** Green

**Junction box:** Manufactured by reputed manufacturer of specified capacity, facility for all mounting, with door & lock, aluminium frame for fixing of Krone, duly enclosed in cabinet made from 18 SWG CRCA sheet with powder coating of required colour. The depth of the box should consider the height of KRONE module plus protection magazine.

**Over Voltage protection Magazine:** Manufactured by reputed manufacturer of 10 pair capacity, with 3 pole gas discharge tube should be properly fitted on KRONE module in MDF / Junction box.

**Rosette box:** PVC / Bakelite box with LED indicator, RJ 11 jack, facility for fixing on wall.

**Jumper wire:** Twin twisted PVC insulated with Tinned copper solid conductor minimum 0.5mm dia.



**KRONE Module:** Disconnection type KRONE module having capacity to connect 10 pairs with silver-plated terminal contacts.

**RG-11 Co-axial low voltage grade cable:** PVC insulated with Tinned copper solid conductor minimum 0.5 mm dia, with connector at both ends suitable for termination in RJ type socket.

**PBX (Analogue type):** Manufactured by reputed manufacturer and approved by Telephone Engineering Certificate (TEC) of specified extensions, having following features:

- Direct Inward dialling (DID) with voice guidance facility.
- Caller line Identification (CLI) on Analog as well as digital extension.
- Call Billing software (CB)
- Dynamic STD locking
- Conferencing facility for specified extensions.

**EPABX (Digital type):** Manufactured by reputed manufacturer and approved by Telephone Engineering Certificate (TEC) of specified extensions, having following features:

- Direct Inward dialling (DID) with voice guidance facility.
- Caller line Identification (CLI) on Analog as well as digital extension.
- Call Billing software (CB)
- Dynamic STD locking
- Conferencing facility for specified extensions.
- Provision of battery back-up and power failure line transfer.

#### **4. Method of Construction:**

##### **4.1 Drawing of telephone wire through Steel conduit I PVC conduit I PVC Trunking:**

As specified in Chapter for Point Wiring.

#### **4.2 Erection of Jelly filled armoured Telephone cable:**

Erection shall be done as per the layout finalized, in perfect level and plum. Before fixing the cable shall be straightened as far as possible for good aesthetics look. Cable shall be fixed with saddles firmly clipped on cable. Saddles shall be fixed to wall with minimum 50x8mm SM screws with plugs/wooden gutties (Distance between two saddles shall be minimum 600 mm). Wooden gutties shall be used wherever required (Especially for stonewall). The entries made in wall, floor slab, etc for laying the cable shall be made good by filling and finishing with plastering the same.

#### **4.3 Erection of MDF Junction box / Rosette box / PBX / EPABX, etc:**

Specified equipment shall be fixed to wall with minimum 50x8 mm SM screws, with necessary plugs, wooden gutties, etc. or may be fixed on Table Top if required.

#### **5. Mode of Measurement:**

Work done for telephone in Steel I PVC conduit I PVC Trunking will be measured on running meter basis, (i.e. per running meter) for each single run. For the other accessories / equipments shall be done as per unit specified. (I.e. Job / each)

#### **1.12 Computer Cabling (COC)**

##### **A) UTP Networking Cable**

##### **General:**

All material shall conform to relevant standard as per ISO/IEC11801, CENELEC EN50173 & TIA/EIA 568-B2-1; CUL listed & ETL verified.

Material and Work not qualifying to any provision mentioned above shall be to the

satisfaction of Engineer in Charge.

##### **Scope:**

##### **Specification No (WG-COC/NC)**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

To lay the cables for Computers on surface of wall or ceiling concealed in slab, wall, under flooring etc, through existing metallic conduits, rigid PVC conduits, PVC trunking, with all necessary hardware, material, etc. as specified. The cable shall be used only for connections between Information Outlet & Patch/ Multimax Panel. (Exception: For making MDIX patch cord)

### **Material:**

#### ***UTP cable:***

4 pairs, 100 ohms, unshielded twisted pair (UTP), each pair separated by a PE former (Star shaped) solid 23AWG tinned copper conductor rated for temperature of 750 C, PVC insulated grey colour with following types as in the table 1.12/1

**Table 1.12/1**

#### **Sr. No. Type Class Tested frequency**

<b>Sr. No.</b>	<b>Type</b>	<b>Class</b>	<b>Tested frequency</b>
1	Cat 6	E	350MHz
2	Cat 6+	E	500MHz

1 The Category 6 cable and Category 6 channel components shall be manufactured by a single manufacturer. The manufacturer shall warrant the Category 6 channel cable, components, and applications for a period of 20 years.

2 The Delay Skew on the 100 meter channel shall not exceed 30 ns

3 The 20 year warranty shall be a transferable warranty and has component replacement policy in case of manufacturing defect

4 Category 6, 100mtr channel, **4-connection** model should guarantee 400% margin over standard NEXT specification across swept frequency

5 Category 6, 100mtr channel, **6-connection** model should guarantee +4dB margin over standard NEXT Specification across swept frequency (1~250MHZ)

6 The high performance Category 6 UTP cable 23AWG shall be of the traditional round design with Mylar bisector tape Non-Plenum rated.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

7 The cable shall support Voice, Analog Baseband Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS422, RS-485, 10BASE - T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, IEEE 1394B S100 and S400, as well as all 77 channels (550 MHz) of analog broadband video.

8 The cable jacket shall comply with Article 800 NEC for use as a non-plenum cable. The 4 pair UTP cable shall be UL® and c (UL®) Listed Type CM.

9 Performance shall be characterized to 550 MHz to support high-bandwidth video applications

### **Non Plenum CAT6 UTP Cable**

1 Weight=25.3 lb (1000 ft)

2 Jacket Thickness=.022 in

3 Outside Diameter=0.232 in

4 Conductor Diameter=.022 in

5 Insulation Type=High density Polyethylene

6 Jacket Material=PVC

7 Maximum Pulling Tension=25 lbs

8 Nom. Velocity of Propagation=0.69

9 Max DC Resistance=9.83 Ohms/100m

10 Mutual Capacitance @ 1 kHz = 4.95 nF/100m

11 Operating Temperature= -20 to 60° C

12 The high performance Category 6 UTP cable shall be of the **traditional round design with Mylar bisector tape.**

13 The 4 pair UTP cable shall be UL Type CM (non-plenum)

14 Performance shall be characterized to 550 MHz to support high-bandwidth video applications

### **Method of Construction:**

The cable shall be laid in provided separate casing n capping/ PVC conduit/ trunking 400mm away from electrical cables wherever required without sharp bends. The cables shall be spliced at both the ends for punching/ crimping at keystone jacks/ UTP connectors.

**Mode of measurement:** Executed quantity shall be measured on running metre basis.

## B) UTP Patch cord

**Scope:**

### Specification No (WG-COC/PC)

Structured cabling, to make connections from switch to patch panel or information outlet to computer

**Material:**

#### **UTP Patch Cord:**

Assembly (conforming to EIA/TIA 568B-2-1) of Cat 6 type 4 unshielded twisted pair 24-26AWG (0.51mm-0.40mm), each pair separated by a PE former (Star shaped) 100 ohms stranded wire PVC insulated cables with modular RJ-45 polycarbonate UL94V housing 15 milliohms gold over nickel contacts (superior three piece connector) crimped on both ends with T568A & T568B wiring schemes with 8P8C connection. The cord shall be branded. The cords shall be used in structured cabling in accordance with following table 1.12/2.

**Table 1.12/2**

Sr. No.	Length	Use in
1	1m	from switch to patch panel
2	3m	from computer to information outlet

1 All patch cords shall exceed TIA/EIA and ISO/IEC Category 6/Class Specifications.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

2 All patch cords shall be backward compatible with Category 5 and Category 5E systems.

3 The patch cords shall incorporate an anti-snap feature that provides maximum protection from snagging during moves and re-arrangements.

4 Patch cords shall be UL listed, UL-C certified and AUSTEL approved.

5 Patch cords shall support network line speeds in excess of 1 gigabit per second.

### **Physical Specifications:**

**Contact Material:** Phosphor Bronze

**Contact Plating:** Gold 50 micro-inch (1.27 microns) Nickel 100 micro -inch (2.54 microns)

**Insertion Life:** 750 minimum

**Plug Material:** Polycarbonate UL-rated 94 V-O

**Operating Temperature:** 14°F to 140°F (-10°C to 60°C)

### **Method of construction:**

The patch cord shall be erected for making connections from switch to patch panel or from computer to information outlet.

**Mode of measurement:** Executed quantity shall be counted on number basis

### **Sr. No. Length Use in**

1 1m from switch to patch panel

2 3m from computer to information outlet

### **BACKBONE (Fibre Network)**

#### **C) PVC Armoured Optical Fibre Cable (OFC)**

##### **General:**

All material shall conform to relevant standard as per IEEE, EIA/TIA 568-B.3

**Scope:**

**Specification No (WG-COC/OFC)**

Optical fibre cable is used for connecting remote places networks by means of fibre switch or fibre module without much loss of signal.

**Material:**

**Optical Fibre Cable:**

Dielectric & metallic sheath armoured multimode optical fibre cable for underground/ aerial applications, fibres separated into binder groups inside a Industry standard 3mm gel filled buffer tubes standard around a central strength member; water blocked with dry water blocking material, making access & handling individual tubes easier & craft-friendly cable core; operating temperature of 40 - 700 C, crush resistance of 44N/m, as per table 1.12/3.

**Table 1.12/3**

**Physical Specifications:**

Fiber Count	Subunits	Outer Diameter in. (mm)	Weight lbs/kit kg/km	Minimum Bend		Max. Tensile Load		Max. Vertical Rise Feet (Meter)
				Radius In. (cm)		lbs. (Newtons)		
				Loaded	Unloaded	Short Term	Long Term	
4 - 48	5	0.46 (11.7)	63 (94)	9.2 (23.4)	4.6 (11.7)	607 (2700)	180 (800)	2856 (871)
72	6	0.50 (12.7)	72 (107)	10.0 (25.4)	5.0 (12.7)	607 (2700)	180 (800)	2509 765)
96	8	0.58 (14.7)	95 (141)	11.5 (29.4)	5.8 (14.7)	607 (2700)	180 (800)	1904 (580)
144	12	0.74 (18.9)	146 (217)	14.8 (37.8)	7.4 (18.9)	607 (2700)	180 (800)	1237 (377)
288	24	0.86 (21.9)	211 (315)	17.2 (43.8)	8.6 (21.9)	607 (2700)	180 (800)	852 (260)

Note\* There are 12 fibres per tube

04/ 06/ 12/ 24 fibres				
Sr. No.	Grade	Core dia.	1Gbps Distance at wavelength	
			850nm	1300nm
1	FR	62.5 µm	3000m	550m
2	FR	50 µm	1100m	600m
3	FRLS	62.5 µm	3000m	550m
4	FRLS	50 µm	1100m	600m

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

1. The cable shall support Gigabit Ethernet and legacy applications including Ethernet, Fast Ethernet, Token Ring, ATM and FDDI.
2. The loose tube dielectric OSP cable shall be armored with a corrugated polymer
3. coated steel tape and constructed with industry standard 3mm buffer tubes, stranded around a central strength member.
4. The armor layer shall provide crush protection meeting the Telcordia requirements for Superior Armored cable.
5. The buffer tubes shall be compatible with standard hardware, cable routing and fan-out kits.
6. The cable core shall be water blocked with dry water-blocking materials, making access and handling of individual tubes easier and craft-friendly.
7. The cables shall be designed for point-to-point applications as well as mid-span access, and provide a high-level of protection for fiber installed in the outside plant environment.

S. No	Features
1	Support 10 Gbps up to 300 meters
2	Meets and exceeds the next generation multimode fiber (OM3) specifications in standards
3	Gigabit Ethernet is supported up to over 1.0 kilometre for 1000BASE-SX.
4	Supports very high speed data transmission by controlling DMD
5	Differential Mode Delay Exceeds TIA-492AAAC-A (IEC-60793-2-10ed2) @ 850nm
6	> 2,000 MHz-km laser bandwidth at 850 nm
7	Core Diameter should be $50.0 \pm 3.0 \mu\text{m}$
8	Cladding Diameter should be $125.0 \pm 1.0 \mu\text{m}$
9	Max. Attenuation, Loose Tube Cable 3.0 dB/km
10	Coating/Cladding Concentricity Error should be $\leq 6 \mu\text{m}$
11	Clad Non-Circularity $\leq 1\%$
12	Zero Dispersion Wavelength 1297-1316 nm
13	Water Immersion, 73.4°F (23°C) should be $\leq 0.20 \text{ dB}$

### Environmental and Mechanical

Operating Temperature -40° to +70°C FOTP - 3



Installation Temperature 20°to +70°C N/A

Storage Temperature -40°to +70°C N/A

Crush Resistance 44 N/mm FOTP - 41

Impact Resistance Exceeds FOTP - 25

Flexing Exceeds FOTP - 104

Twist Bend Exceeds FOTP - 85

**Cable Identification:**

**Buffer Tubes and Fibres are identified with standard color coding:**

1 - Blue 5 - Slate 9 - Yellow

2 - Orange 6 - White 10 - Violet

3 - Green 7 - Red 11 - Rose

4 - Brown 8 - Black 12 - Aqua

**Hardware:**

Sheet Metal (SM) screws of required sizes, plugs, wooden gitties, clips etc.

**Method of Construction:**

As per the method of construction of PVC armoured cable. But these cables shall be tagged as "OFC" every metre length & can be laid in trench side by side. For underground cable laying cable indicator mentioning "Optical Fibre Cable" is a must.

**Mode of measurement:** Executed quantity shall be measured on running meter basis.

**D) Fibre Patch Cord (FPC)**

**General:**

All material shall conform to relevant standard as per IEEE, EIA/TIA, CENELEC

**Scope:**

**Specification No (WG-COC/FPC)**

The cord is to be used to connect fibre optic equipment to fibre optic cross-connects, interconnects & information outlets. (e.g. Remote Ethernet switch with fibre optic module can be connected to another same type of switch or Fibre Optic Switch.)

**Material:**

FRLS duplex fibre patch cord/ pigtails 1mtr in length with LC/ SC/ ST termination consisting of 1.6mm/ 3.0mm dia. 62.5um fibre with minimum bandwidth of 200MHz at 850nm & 500MHz at 1300nm with following specifications, as per table 1.12/4.

**Table 1.12/4**

Sr. No.	Outside dia.	Cable retention strength	Minimum Bend Radius	Maximum Cordage Tensile Load
1	1.6mm: 1.6mm x 3.3mm	50 Newton	Loaded: 5.1cm Unloaded: 3.5cm	Short Term : 3111 Newton Long Term: 93 Newton
2	3.0mm: 3.0mm x 5.9mm	50 Newton	Loaded: 5.8cm Unloaded: 3.5cm	Short Term : 400 Newton Long Term: 120 Newton

1. The fiber-optic patch cord shall be configurable with standard LC, SC, and ST terminations, and shall be available in either 1.6 mm or 3.0 mm duplex zip cord.
2. The 1.6 mm cordage shall exceed the requirements for larger diameter cordage and allows at least twice as many fibers to be installed in a cabinet.
3. The duplex cordage shall be 1.6 mm by 3.5 mm and have two single fiber cords joined together with a web.
4. The connector shall have a pull-proof design that helps prevent accidental disconnects and helps to assure optimal performance of equipment.
5. Custom hybrid patch cords shall also be available, to simplify migration to industry leading connectors.

6. All fibers shall be Differential Mode Delay (DMD) tested by using a high-resolution testbench that exceeds the FOTP-220 standards and shall be independently certified by UL®.

7. All patch cords shall be a distinctive aqua color for positive identification.

**Physical Specifications:**

Minimum Bandwidth @ 850 nm: 4700 MHz-km (laser), 3500 MHz-km(OFL)@  
1300 nm: 500 MHz-km (laser), 500 MHz-km(OFL)

Attenuation: 3.0 dB/Km @ 850 nm, 1.0dB/Km @ 1300 nm

Cable Outside Diameter: Duplex: 1.6 x 3.7 mm

Min. Bend Radius: 2.5 cm

Operating Temperature Range: -20 to 70 °C

Average Connection Loss: LC = 0.1 dB

Return Loss Minimum: -20 dB

Tip Material: Ceramic

Mating Durability for: 500 Reconnects

Insertion Loss Change: <0.2 dB

Temperature Stability: -40 to + 75 °C

Insertion Loss Change: <0.3 dB

**Method of Construction:**

Supplying & plugging FRLS duplex fibre patch cord/ pigtails into the LC/ SC/ ST termination of LIU & fibre module/ fibre switch port complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis

**1.13 Networking Components (NWC)**

**Switches/ Routers**

**A) Web Smart Power Over Ethernet Switch (ENS)**

**General:**

All material shall conform to relevant standard as per IEEE802.3af PoE

**Scope:**

**Specification No (WG-NWC/ENS)**

Preferred in Wireless LAN obviating the use of external power supply for Access Points

**Material:**

**Ethernet Switch:**

Ethernet Switch with PoE: 24 ports PoE (Power Over Ethernet) with IEEE 802.3af PoE protocol, each PoE to supply up to 15.4 Watts for connecting devices such as Access Point needing additional power, 10/100Base-Tx 24 Fast Ethernet ports, 1000 Base-T 4 ports, 2 combo ports for flexible copper/fibre Gigabit connections, VLAN web manageable switch with rack mountable clips, screws, console utility software, mechanisms to detect an attack against the central processing unit of the switch and to take corrective action on attacking interface.

1. Feature-rich solution with functionality enabling by Secure Always On access to mission critical applications
2. High performance switch architecture and stacking performance delivering 320Gbps
3. High-density 10/100 ports for edge connectivity
4. Two combo 10/100/1000/SFP uplinks ports per switch for high speed gigabit or low speed connections such as 100FX
5. Simplified converged network deployments through support for Power over Ethernet (PoE), advanced Quality of Service (QoS), and auto-configuration of ports with IP Handsets & Wireless Access Points

**Technical Specifications:**

- 10/100 Power over Ethernet ports: 24 per switch
- 10/100/1000/SFP Gigabit ports: 2 per switch
- SFP support: SX, LX, XD, ZX, CWDM, 100FX, & T1
- Resilient Stacking: up to 8 units / 192 ports per stack
- Stacking ports: 2 built-in stacking ports per switch

- Total stacking capacity: 320 Gbps
- Individual switch packet throughput: 6.6 Mpps
- Individual switch capacity: 48.8Gbps
- Concurrent VLANs: 256
- Jumbo Frame Support on Gigabit ports
- Maximum MAC addresses: 8,000

**Standards Compliance:**

- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE (ANSI) 802.3 Auto-negotiation
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.3x Flow Control
- IEEE 802.1Q VLANs
- IEEE 802.1p Priority Queues
- IEEE 802.1D Spanning Tree
- IEEE 802.1w Rapid Spanning Tree
- IEEE 802.1s Multiple Spanning Tree Groups
- IEEE 802.3ad Link Aggregation
- IEEE 802.1X Ethernet Authentication Protocol
- IEEE 802.3AB Link Layer Discovery Protocol
- RFC 783 Trivial File Transfer Protocol (TFTP)
- RFC 791/950 Internet Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 854 Telnet Server and Client
- RFC 951 / 1542 BOOTP

- RFC 1112 Internet Group Management Protocol v1
- RFC 1215 SNMP Traps Definition
- RFC 1271 / 1757 / 2819 RMON
- RFC 1361 / 1769 Simple Network Time Protocol (SNTP)
- RFC 1493 Bridge MIB
- RFC 1573 / 2863 Interface MIB
- RFC 1643 / 2665 Ethernet MIB
- RFC 1905 / 3416 SNMP
- RFC 1906 / 3417 SNMP Transport Mappings
- RFC 1907 / 3418 SNMP MIB
- RFC 1945 HTTP v1.0
- RFC 2011 SNMP v2 MIB for IP
- RFC 2012 SNMP v2 MIB for TCP
- RFC 2013 SNMP v2 MIB for UDP
- RFC 2138 RADIUS
- RFC 2236 Internet Group Management Protocol v2
- RFC 2474 Differentiated Services Support
- RFC 2570 / 3410 SNMPv3
- RFC 2571 / 3411 SNMP Frameworks
- RFC 2572 / 3412 SNMP Message Processing
- RFC 2573 / 3413 SNMPv3 Applications
- RFC 2574 / 3414 SNMPv3 USM
- RFC 2575 / 3415 SNMPv3 VACM
- RFC 2576 / 3584 Co-existence of SNMP v1/v2/v3
- RFC 2660 HTTPS (Secure Web Server)
- RFC 2665 Ethernet MIB
- RFC 2863 Interfaces Group MIB

- RFC 2674 Q-Bridge MIB
- RFC 2737 Entity MIBv2
- RFC 2819 RMON MIB

**Additional features:**

- Customizable Auto-negotiation Advertisements (CANA)
- Distributed Link Aggregation Groups
- Virtual Link Aggregation Control Protocol (VLACP)
- Single IP address for stack management
- Resilient fail-safe stacking
- Automatic Unit Replacement (Configuration and Software)
- Automatic Detection Automatic Configuration (ADAC)
- 802.1X Single Host Single Authentication
- 802.1X Single Host Multiple Authentication
- 802.1X Multiple Host Multiple Authentication
- 802.1X Guest VLAN
- 802.1X Non-EAP (NEAP) access
- DSCP-based Recognition, Marking and Recolouring
- Ingress and Egress Port Mirroring
- Broadcast and Multicast Rate limiting per port
- ASCII Configuration File
- Web, NNCLI, JDM
- SSHv2 and SNMPv3 secure management support
- Secure Network Access (NSNA) support
- BPDU Filter
- Stack Monitor
- USB software and ASCII configure upload

- New unit quick to configure

### **Resiliency Features:**

- Should support a technology which will allow multiple physical network links between two network switches and another device (which could be another switch or a network device such as a server) to be treated as a single logical link and load balance the traffic across all available links
- Generally all the physical ports in the link aggregation group must reside on the same switch. It should also support protocols remove this limitation by allowing the physical ports to be split between two switches.
- Load balancing mechanism should not be round robin or dynamic which may not work with applications like Voice & Video, where session persistence is must. Main Objective of above features is to achieve Active-Active Cluster Switching. And achieve sub second fail over in case of Link failure & Device Failure, which will result in 99.999% uptime.

### **Power over Ethernet specifications:**

- 802.3af compliant with Power classification support
- Signal pair power delivery
- Maximum 15.4 watts per port
- Maximum DTE Power AC 320 watts
- Maximum DTE Power AC + RPS 740 watts

### **Electrical specifications:**

- Power supply: AC 100-240V, 50-60Hz
- Input current at 110v: 7.1A
- Input current at 220v: 3.6A
- Max power consumption: 470W



**Dimensions:**

- Width: 438.2mm (17.25 in)
- Height: 1RU 43.7mm (1.72 in)
- Depth: 368.3mm (14.5 in)

**Environmental specifications:**

- Operating temperature: 0 to 50 degrees C
- Storage temperature: -25 to 55 degrees C
- Relative humidity: 10% - 90%vnon-condensing
- Peak noise level: 42.3 dB
- Thermal rating: 375 BTU/hr
- Calculated MTBF: 242,552 hrs

**Safety Agency Approvals:**

- IEC 60950 International CB Certification
- EN 60950 European Certification
- UL60950 US certification
- CSA22.2, #60950 Canadian Certification
- NOM Mexican Certification

**Electromagnetic Emissions and Immunity:**

- CISPR22, Class A/CISPR24 International
- EN55022, Class A/EN55024 European
- FCC, Part 15, Class A US Certification
- ICES-003, Class A Canadian Certification
- AN/NZS 3548 Australian/NZ Certification
- BSMI - Taiwan - CNS 13438, Class A

- MIC - Korea - MIC, No. 2001-116
- VCCI Class A Japanese Certification

**Hardware:** Chromium plated brass nuts & bolts with special type of U shaped squarewashers of required sizes.

**Method of construction:**

The Ethernet switch fitted with rack mountable clips shall be fixed in U Rack (NetworkingCabinet) with 4 nos. of chromium plated brass nuts & bolts. The switch shall be configured for TCP/IP addresses for switch IP & Gateway.

**Mode of measurement:** Executed quantity shall be counted on number basis

**B) 24 Port Gigabit Switch (GBS)**

**Scope:**

**Specification No (WG-NWC/GBS)**

To be used in wired LAN connections.

**Material:**

**Gigabit Ethernet Switch:**

24 nos. of 10/100/1000 Base-T Gigabit ports, 2 or 4 combo SFP slots for flexible fibrebackbone, VLAN, manageable, 19" standard rack mountable, auto detection of MDI/MDIX, Layer 2, Safeguard Engine to protect against traffic flooding caused by virus/worm outbreaks with rack mountable clips, screws, console utility software.

1. Feature-rich solution with functionality enabling by Secure Always On access to mission critical applications
2. High performance switch architecture and stacking performance delivering 320Gbps
3. High-density 10/100/1000 ports for edge connectivity
4. Shared SFP uplinks ports per switch for gigabit fibre connectivity

**Technical Specifications:**

- 10/100/1000 Ethernet ports: 24 per switch
- SFP Gigabit ports: 4 per switch
- SFP support: SX, LX, XD, ZX, CWDM, 100FX & T1
- Resilient Stacking: up to 8 units
- Stacking ports: 2 built-in ports per switch
- Total stacking capacity: 320 Gbps
- Individual switch packet throughput: 36 Mpps
- Individual switch capacity: 88 Gbps
- Concurrent VLANs: 256
- Jumbo Frame Support on Gigabit ports
- Maximum MAC addresses: 8,000

**Standards compliance:**

- IEEE 802.3 10BASE-T Ethernet
- IEEE 802.3u 100BASE-TX Fast Ethernet
- IEEE (ANSI) 802.3 Auto-negotiation
- IEEE 802.3z Gigabit Ethernet
- IEEE 802.3x Flow Control
- IEEE 802.1Q VLANs
- IEEE 802.1p Priority Queues
- IEEE 802.1D Spanning Tree
- IEEE 802.1w Rapid Spanning Tree
- IEEE 802.1s Multiple Spanning Tree Groups
- IEEE 802.3ad Link Aggregation
- IEEE 802.1X Ethernet Authentication Protocol

- IEEE 802.3AB Link Layer Discovery Protocol
- RFC 783 Trivial File Transfer Protocol (TFTP)
- RFC 791/950 Internet Protocol (IP)
- RFC 792 Internet Control Message Protocol (ICMP)
- RFC 826 Address Resolution Protocol (ARP)
- RFC 854 Telnet Server and Client
- RFC 951 / 1542 BOOTP
- RFC 1112 Internet Group Management Protocol v1
- RFC 1215 SNMP Traps Definition
- RFC 1271 / 1757 / 2819 RMON
- RFC 1361 / 1769 Simple Network Time Protocol (SNTP)
- RFC 1493 Bridge MIB
- RFC 1573 / 2863 Interface MIB
- RFC 1643 / 2665 Ethernet MIB
- RFC 1905 / 3416 SNMP
- RFC 1906 / 3417 SNMP Transport Mappings
- RFC 1907 / 3418 SNMP MIB
- RFC 1945 HTTP v1.0
- RFC 2011 SNMP v2 MIB for IP
- RFC 2012 SNMP v2 MIB for TCP
- RFC 2013 SNMP v2 MIB for UDP
- RFC 2138 RADIUS
- RFC 2236 Internet Group Management Protocol v2
- RFC 2474 Differentiated Services Support
- RFC 2570 / 3410 SNMPv3
- RFC 2571 / 3411 SNMP Frameworks
- RFC 2572 / 3412 SNMP Message Processing

- RFC 2573 / 3413 SNMPv3 Applications
- RFC 2574 / 3414 SNMPv3 USM
- RFC 2575 / 3415 SNMPv3 VACM
- RFC 2576 / 3584 Co-existence of SNMP v1/v2/v3
- RFC 2660 HTTPS (Secure Web Server)
- RFC 2665 Ethernet MIB
- RFC 2863 Interfaces Group MIB
- RFC 2674 Q-Bridge MIB
- RFC 2737 Entity MIBv2
- RFC 2819 RMON MIB

**Additional features:**

- Customizable Auto-negotiation Advertisements (CANA)
- Distributed Link Aggregation Groups
- Virtual Link Aggregation Control Protocol (VLACP)
- Nortel Multiple Spanning Tree groups
- Single IP address for stack management
- Resilient fail-safe stacking
- Automatic Unit Replacement (Configuration and Software)
- Automatic Detection Automatic Configuration (ADAC)
- 802.1X Single Host Single Authentication
- 802.1X Single Host Multiple Authentication
- 802.1X Multiple Host Multiple Authentication
- 802.1X Guest VLAN
- 802.1X Non-EAP (NEAP) access
- DSCP-based Recognition, Marking and Recolouring
- Ingress and Egress Port Mirroring

- Broadcast and Multicast Rate limiting per port
- ASCII Configuration File
- Web, NNCLI, JDM
- SSHv2 and SNMPv3 secure management support
- Nortel Secure Network Access (NSNA) support
- BPDU Filter
- Stack Monitor
- USB software and ASCII configure upload
- New unit quick to configure

**Resiliency Features:**

- Should support a technology which will allow multiple physical network links between two network switches and another device (which could be another switch or a network device such as a server) to be treated as a single logical link and load balance the traffic across all available links
- Generally all the physical ports in the link aggregation group must reside on the same switch. It should also support protocols remove this limitation by allowing the physical ports to be split between two switches.
- Load balancing mechanism should not be round robin or dynamic which may not work with applications like Voice & Video, where session persistence is must.
- Main Objective of above features is to achieve Active-Active Cluster Switching .And achieve sub second failover in case of Link failure & Device Failure which will result in 99.999% uptime

**Electrical specifications:**

- Power supply: AC 100-240V, 50-60Hz
- Input current at 110v: 1.3A
- Input current at 220v: 0.7A
- Max power consumption: 150W

**Dimensions:**

- Width: 438.2mm (17.25 in)
- Height: 1RU 43.7mm (1.72 in)
- Depth: 368.3mm (14.5 in)

**Environmental specifications:**

- Operating temperature: 0 to 50 degrees C
- Storage temperature: -25 to 55 degrees C
- Relative humidity 10% - 90% non-condensing
- Peak noise level: 42.4 dB
- Thermal rating: 290 BTU/hr
- Calculated MTBF: 312,001 hrs

**Safety Agency Approvals:**

- IEC 60950 International CB Certification
- EN 60950 European Certification
- UL60950 US certification
- CSA22.2, #60950 Canadian Certification
- NOM Mexican Certification

**Electromagnetic Emissions and Immunity:**

- CISPR22, Class A/CISPR24 International
- EN55022, Class A/EN55024 European
- FCC, Part 15, Class A US Certification
- ICES-003, Class A Canadian Certification
- AN/NZS 3548 Australian/NZ Certification
- BSMI - Taiwan - CNS 13438, Class A

- MIC - Korea - MIC, No. 2001-116
- VCCI Class A Japanese Certification

**Hardware:**

Chromium plated brass nuts & bolts with special type of U shaped square washers of required sizes.

**Method of construction:**

The Ethernet switch fitted with rack mountable clips shall be fixed in U Rack (Networking Cabinet) with 4 nos. of chromium plated brass nuts & bolts. The switch shall be configured for TCP/IP addresses for switch IP & Gateway.

**Mode of measurement:** Executed quantity shall be counted on number basis

**C) Broadband ADSL Router (ADSL)**

**General:**

All material shall conform to relevant standard as per ITU G.992.2 & RFC

**Scope:**

**Specification No (WG-NWC/ADSL)**

For broadband internet connections to individual computer or Wired LAN/ Wireless LAN.

**Material:**

**Broadband ADSL Router:**

ADSL2+ broadband router with PPP (Point-to-Point Protocol), DHCP support, TCP/IP, downstream up to 24Mbps, upstream up to 1Mbps, RJ-11 for ADSL line, RJ-11 for phone line with Patch cord 3 metre in length, 10/100 Base-T port, USB 1.1 & 9V adaptor with UTP (Ethernet) Patch Cord, USB 2.0 patch cord, USB driver software



- **Designed for the small to medium business** - Simpler than enterprise class routers but more robust than consumer grade routers
- **Secure** - Good security and heavy encryption, but easy to implement; simple yet stateful firewall with simple filters
- **Simplified architecture** - Has a smaller processor that does not require a noisy fan, making it small and attractive for in-office or desk top installation

**Note: Provision of Network Interface Card (NIC) shall be made for computer without built in NIC.**

#### **Input/Output Requirements:**

- WAN 1- 10/100 Base-T Auto-sensing - RJ-45
- LAN -4 Port Ethernet 10/100 Base-T Auto-sensing switch – RJ- 45 (fifth port for internal connection)

#### **VPN Services:**

- Minimum 10 IPSec tunnels
- IKEv1 Main Mode
- IKEv1 Aggressive Mode
- Up to 3 IP pools for Client
- 16 Split networks configured
- 64 Subnets specified for Split (inverse) network
- Diffie-Hellman Group 1, 2
- IPSec Tunnel Mode
- ESP
- Support for Dynamically addressed peers – ABOT
- NAT Traversal
- IPSec Transport Mode
- Keep Alive – For branch office and client tunnels

- VPN Router Client termination

**Cryptographic Services:**

- DES
- 3DES
- Data authentication SHA-1
- Data authentication MD-5
- AES -128
- AES – 192, 256 – Branch Office

**Authentication Services:**

- Pre-shared secrets
- External RADIUS support
- 802.1x/EAP support

**Firewall:**

- Statefull Packet Inspection
- IP application Inspection (FTP, SMTP, HTTP, Telnet, SSL, DNS, etc.)
- Denial of Service (DoS) detection and prevention
- URL Filtering
- Content filtering

**ALG's:**

- CU-SeeME
- FTP
- SIP
- H.323

- IPSEC
- VDiLive
- RealAudio

**IP Services: NAT:**

- NAT, Many to One, Static, Many to Many, Many One-to-One
- Port Forwarding
- IPSec pass-through
- SIP and H.323 ALG's
- Cone NAT
- NAT support for tunnel Mode IPSec tunnels

**IP Services: Routing:**

- Clear text routing
- Static
- RIP v1
- RIP v2

**IP Services: DHCP:**

- Client
- Server
- Relay
- Static mapping – 8 IP address lease mapping

**IP Services: DNS:**

- DNS Proxy
- Dynamic DNS

**IP Services: NTP:**

- RFC-867, 868, 1305

**Layer Two Protocols:**

- PPPoE
- IP masquerade/ alias – Configurable MAC address

**Performance and Scaling:**

- 20 Mbps 3DES throughput w/ 1500 byte packets
- 10 IPSec tunnels

**Management:**

- TFTP/FTP firmware upload
- RS232 console port
- Built-in Diagnostic tool
- SNMP
- Web GUI
- CLI (Command Line Interpreter)
- Remote management (FTP, Telnet, Web)
- Backup and restore configuration via FTP and Web

**WAN and LAN Ports:**

- The WAN and LAN ports are 10/100-base T Ethernet ports, without PoE

**Two-Port Router:**

- The router is based on the Intel IXP-425 network processor, running at 266 MHz. It will have 64 Mbytes of FLASH, and 32 Mbytes of RAM.

**5-Port Switch:**

- The 5-port layer-2 switch uses the Infineon 6996i chip

**Serial Port:**

- The serial port provides a DCE connection that can be used for either WAN back-up or for installing software into a router that has a corrupted software load

**Power Supply:**

- The router will be powered by 19 volts DC. The power supply circuit block will convert this supply to the supply voltages needed by the rest of the circuitry. The Business SecureRouter 222 uses a universal wall-mount power supply.

**Method of construction:**

The ADSL Router shall be connected directly to the incoming phone line without any parallel telephone, then to telephone to avoid breaks in Internet connection, 9V DC adaptor connected to provide power supply, UTP patch cord for connections between router Ethernet port to computer/ switch. The router shall be configured as per the requirements of Broadband Internet Service Provider. As far as possible use of USB port shall be avoided.

**Mode of measurement:** Executed quantity shall be counted on number basis

**Wireless LAN**

**D) Indoor LAN Dipole Antenna (DPA)**

**General:**

All material shall conform to relevant standard as per IEEE.

**Scope:**

**Specification No (WG-NWC/DPA)**

To enhance the signal strength of Access Point & Wireless PCI adaptor/ Router up to 500 metres.

**Material:**

***Indoor LAN Dipole Antenna:***

2.4 GHz, 5dBi gain, 50 ohms Omni-Directional Indoor Antenna outer covering made from polyurethane, polycarbonate swivel mechanism with built-in connector (RP-SMA & Reverse SMA/ TNC) for 802.11b/g wireless network

**Method of Construction:**

Supplying & erecting 2.4 GHz, 5dBi Omni-Directional Antenna to be screwed to Accesspoint/ wireless PCI adaptor complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**E) Omni Directional Antenna (ODA)**

**Scope:**

**Specification No (WG-NWC/ODA)**

To enhance the signal strength of Access Point & Wireless PCI adaptor/ Router at difficult to reach or far places.

**Material:**

***Omni Directional Antenna:***

2.4 GHz, 4dBi gain, Collinear, 50 ohms Omni-Directional Indoor Antenna covering horizontal 360 deg. vertical 36 deg. with 1.5m ULA-316 fixed cable, connectors (RPSMA & Reverse SMA/ TNC), sturdy magnetic base stand to place it on flat surfaces & can be mounted on wall for 802.11b/g wireless network

**Method of Construction:**

Supplying & erecting 2.4 GHz, 4dBi Omni-Directional Antenna on wall or on the desktop or suitable place which shall be at least 150mm away from electronic devices such as computers, TV, video equipment & audio/video tapes.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**F) Aesthetic Omni Directional Antenna (AODA)**

**Scope:**

**Specification No (WG-NWC/AODA)**

To enhance the signal strength of Access Point & Wireless PCI adaptor/ Router at difficult to reach or far places.

**Material:**

**Aesthetic Omni Directional Antenna:**

2.4 GHz, 20W (cw) power handling, 40 deg down tilt, 50 ohms Omni-Directional Aesthetic Indoor Ceiling Antenna with ULA-316 fixed cable, connectors (RP-SMA & Reverse SMA/TNC) for 802.11b/g wireless network.

S No.	Type	Colour	Gain (dBi)	Coverage (deg)		Cable (mtr)	Use
				Horizontal	Vertical		
1	Globe	White	4	360	63	2.0	Places with false ceiling
2	Rod	Gray-White	5	360	32	3.0	Any other place

**Hardware:** Sheet Metal (SM) screws of required sizes, plugs, wooden gitties, etc.

**Method of Construction**

Supplying & erecting 2.4 GHz, Omni-Directional Indoor Aesthetic Ceiling Antenna on ceiling at suitable place fixed with required size of SM screws, plugs/ gitties etc. complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**1.13 Networking Accessories (NAS)**

**LAN Accessories**

**A) UTP connector (RJ-45) (UTPC)**

**General:**

All material shall conform to relevant standard as per TIA/EIA 568-B2-1.

**Scope:**

**Specification No (WG-NAS/UTPC)**

To make MDIX (Cross) patch cord required for cascade connections of switches & routers.

**Material:**

***UTP connector:***

Assembly of Gold over nickel contacts with 1.5A current carrying capacity, 30V with 15 milli ohms contact resistance, 8P8C connection easy to crimp with crimping tool in polycarbonate UL94V housing.

**Method of construction:**

The UTP cable shall be spliced, untwisted not more than 12mm, inserted into the connector with sequence as shown in the **diagram \_\_\_\_** as per EIA/TIA 568 B.2-1 & crimped firmly with crimping tool.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**B) Information Outlet (Ethernet) (IO)**

**General:**

All material shall conform to relevant standard as per TIA/EIA 568-B2-1.

**Scope:**

**Specification No (WG-NAS/IO)**

For connecting computers to wired LAN or external wireless Ethernet interface in Wireless LAN.

**Material:**

***Information Outlet Flush/ Surface type:***



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Spring shuttered front access, high impact plastic body FR grade with highperformanceunshielded RJ-45 keystone jack (conforming to EIA/TIA 568-B.2-1 Cat6), 15 milliohms contact resistance, gold over nickel spring contact, 1.5A current carryingcapacity, with T568A/T568B wiring option, insulation displacement connector for cable crimpingto accept 22-26AWG solid wire for connections up to Gigabit Ethernet.

1. All Category 6 outlets shall meet or exceed Category 6 transmission requirements forconnecting hardware, as specified in TIA/EIA 568-B.2-1 Commercial BuildingTelecommunications Cabling Standard and ISO/IEC 11801:2002 Second Edition.
2. The Category 6 outlets shall be backward compatible with Category 5E, 5 and 3 cordsand cables.
3. The Category 6 outlets shall be of a universal design supporting T568 A & B wiring.
4. The Category 6 outlets shall be capable of being in a modular patching situation or as amodular telecommunication outlet (TO) supporting current 10BASE-T, Token Ring, 100Mbps TP-PMD, 155 Mbps ATM, 622 Mbps ATM using parallel transmission schemesand evolving high-speed, high-bandwidth applications, including Ethernet, 1000BASE-Tand 1.2 Gbps ATM.
5. The Category 6 outlets shall be capable of being installed at either a 45° or a 90°angle in any M-series modular faceplate, frame, or surface-mounted box avoiding theneed for special faceplates.
6. The Category 6 outlets shall have improved pair splitters and wider channel forenhanced conductor placement. The outlet shall also have a low-profile wire cap,which protects against contamination and secures the connection. Multicoloredidentification labels shall be available to assure accurate installation.

### **Hardware:**

Sheet Metal (SM) screws of required sizes, plugs, wooden gitties, etc.

### **Method of construction:**

The Information outlet shall be fixed on the wall with sheet metal (SM) screws, rawlplugs/wooden gitties and making due connections as per EIA/TIA 568 B.2-1 by splicingthe UTP cable, untwisted up to 12mm & punching the 4 pairs in the keystone jack with the helpof punching tool. Not a single wire shall be left without connections.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **C) Keystone jack (RJ-45) (KJ)**

**Scope:**

**Specification No (WG-NAS/KJ)**

Structured cabling, to provide connections to switch/ server from desktop computers/Wireless devices in the patch panel.

**Material:**

#### ***Keystone jack:***

High impact plastic body FR grade with high performance unshielded RJ-45 keystonejack (conforming to EIA/TIA 568-B.2-1 Cat 6) , 20milli ohms contact resistance, goldover nickel spring contact ,1.5A current carrying capacity, with T568A/T568B wiring option, insulation displacement connector for cable crimping to accept 22- 26AWG solid wirefor connections up to Gigabit Ethernet

**Method of construction:**

The keystone jack shall be fixed with the help of its self-locking arrangement in providedpatch panel before making due connection as per EIA/TIA 568 B.2-1 by splicing UTP cable,untwisted up to 12mm & punching the 4 pairs in the keystone jack with the help ofpunching tool.Not a single wire shall be left without connections.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **D) Patch Panel (PP)**

**Scope:**

**Specification No (WG-NAS/PP)**

Structured cabling for the installation of keystone jacks.

**Material:**

***Patch Panel:***

Three piece structure including front panel, cable management plate with pre-fitted Bclipto help in routing cables & metal case of 1.6mm thick Mild Steel powder coated panel of size 442.6mm X 44.5mm with the provision for 1 to 24 high density keystone jacks

1. 24 and 48 port patch panels with 110 IDC connector terminations on rear
2. The patch shall have electrical performance guaranteed to meet or exceed TIA/EIA568-B.2-1 Category 6 and ISO/IEC Category 6/Class E specifications.
3. The panel shall have vertical and horizontal cord organizers available as to improve patch cord management.
4. The panel shall be available in 24-port and 48-port configurations with universal A/B labeling and 110 connector terminations on rear of panel allowing for quick and easy installation of 22 to 24 AWG cable.
5. The patch panel shall have a black powder finish over high-strength steel.
6. The panel shall be equipped with a removable rear mounted cable management bar and front and rear labels.
7. The panel shall be UL listed, UL-C certified and ACA approved.
8. The panel shall support network line speeds in excess of 1 gigabit per second and be backward compatible with Category 5e, 5 and 3 cords and cables.
9. The Category 6 modular jack panels shall meet or exceed the Category 6/Class E standards requirements in ISO/IEC 11801, CENLEC EN 50173 and TIA/EIA and shall be UL Listed.
10. The panels shall be either wall or 19-inch rack mountable.
11. The panels shall meet the following specifications:

**Performance Specifications:**

	High Performance Solution		Premium Performance Solution
	Category 6 Patch Panel	Category 6 Channel (4 Connectors)	
	Typical Worst Pair Margin*	Guaranteed Margin**	Guaranteed Margin**
Insertion Loss	64.3%	5.0%	7.5%
NEXT	6.6 dB	6.0 dB	7.0 dB
PSNEXT	7.3 dB	7.5 dB	8.5 dB
ELFEXT	6.4 dB	6.0 dB	8.0 dB
PSELFEXT	6.1 dB	8.0 dB	10.0 dB
Return Loss	6.6 dB	4.0 dB	4.0 dB
Frequency Range	1-250 MHz	1-250 MHz	1-250 MHz

**Operational Specifications:**

Operating Temperature Range: 14°F to 140°F (-10°C to 60°C)

Storage Temperature Range: -40°F to 158°F (-40°C to 70°C)

Humidity: 95% (non-condensing)

Nominal Solid Conductor Diameter: 0.025 to 0.020 in (0.64 to 0.51 mm) (22 to 24 AWG)

Nominal Stranded Conductor Diameter: 0.025 to 0.020 in (0.64 to 0.51 mm) (22 to 24AWG)

Insulation Size: 0.042 in (1.08 mm) (22 to 24 AWG) Maximum DOD

Insulation Types: All plastic insulates (including PVC, irradiated PVC, Polyethylene, Polypropylene, PTFE Polyurethane, Nylon, and FEP)

Insertion Life: 750 minimum insertions of an FCC 8-Position

Telecommunications Plug Front Panel: Black powder painted steel.

Plastic: High-impact, flame retardant, UL-rated 94V-0 thermoplastic

**Hardware:**

Chromium plated brass nuts & bolts with special type of U shaped square washers of required sizes.

**Method of construction**

The Patch Panel shall be firmly secured in U Rack (Networking Cabinet) with 4 nos. of chromium plated brass nuts & bolts.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **E) Lightguide Interconnect Unit (LIU)**

#### **General:**

All material shall conform to relevant standard as per IEEE, EIA/TIA, CENELEC

#### **Scope:**

#### **Specification No (WG-NAS/LIU)**

To terminate the fibre backbone cables & the equipment cables.

#### **Material:**

#### **Lightguide Interconnect Unit:**

Wall mount type Lightguide Interconnect Unit with dimensions shown in the table, an interfacing unit for fibre cables coming in from field & those originating from the equipments. consisting of fibre spools to provide minimum bending radius & splice trays as splice cover for pigtail splicing, two compartment design with adaptor panel in the centre, compartmentalizing the box, complete aluminium housing, fully powder coated, two doors enclosure with lock & key, rubber grommets at the cable entry points for tight sealing; Splice trays of 140 x 125 x 10mm complete aluminium body fully powder coated with provision for fibre splices fully cushioned splice holder containing grooves for fixing splice protective sleeves; FR grade high impact resistance plastic two halves design stackable sufficient room for excess cable.

Sr. No.	Ports	Dimensions	Fibre splices
1	12	300 x 300 x 80mm	6
2	24	370 x 350 x 80mm	12

#### **Hardware:**

Sheet Metal (SM) screws of required sizes, plugs, wooden gitties, etc.

#### **Method of Construction:**

Supplying & erecting Lightguide Interconnect Unit (LIU) on wall with cable termination complete with sheet metal screws of required size, plugs/ wooden gitties.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **Fibre Accessories**

#### **F) ST "D" type Multimode Adaptor (MMA)**

##### **General:**

All material shall conform to relevant standard as per IEEE, EIA/TIA 568-B.3

##### **Scope:**

##### **Specification No (WG-NAS/MMA)**

To couple two connectors together i.e. to provide optical connectivity between fibrecable & fibre switch/ fibre module.

##### **Material:**

**ST "D" type multimode adaptor** consists of Die cast zinc alloy housing Nickel plated, thread type mounting, washer, nut, 2 nos. of rubber plugs, high precision mechanical design Zirconium/ Phosphor Bronze sleeve having insertion loss < 0.3dBmax, return loss < -40dB.

##### **Method of Construction:**

Supplying & fixing ST " D" type with threads in provided Lightguide Interconnect Unit adaptor panel with nut & washer. The adaptor which is not in use shall be plugged with rubber plugs on both the sides to avoid dust accumulation in the adaptor.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

#### **G) ST "D" type Multimode Connector for LIU (MMA-LIU1)**

##### **General**

All material shall conform to relevant standard as per IEEE, EIA/TIA 568-B.3

##### **Scope:**

**Specification No (WG-NAS/MMA-LIU1)**

To terminate the optical fibre cables in Lightguide Interconnect Unit (LIU)

**Material:**

1. **ST "D" type Multimode connector** consists of bayonet coupling, 2.5mm Zirconium Ferrule, wide range of Ferrule selection, pre-radiused ferrule to provide fast physical contact polishing, insertion loss < 0.5dB.
2. Distilled water (as lubricant & flushing agent between each polishing process).
3. Epoxy or Anaerobic adhesive (to bond the fibre inside the ferrule).

**Tools to be used:**

- Carbide cleaving tool with 30 deg tip (to cut off the fibre to the desired height above the ferrule)
- Portable Microscope (200X minimum)
- Polishing kit (includes a polishing puck, pads & an assortment of diamond, aluminium oxide & silica films)

**Method of Construction:**

The fibre shall be stripped & cleaved. Epoxy and polish connectors field-installed to terminate backbone and distribution cables. Epoxy and polish fibre termination include the following steps: injecting the connector ferrule with epoxy, curing, scribing the protruding fibre(s) from the ferrule, and polishing the ferrule end-face. The correct amount of epoxy must be injected into the ferrule and cured for the specified time and temperature before the ferrule end-face is scribed and polished. Air bubbles shall be avoided in the epoxy to avoid micro-bending and increased loss. The cured epoxy securely bonds the fibre to the ferrule over the operating temperature minimizing relative fibre movement. The connectors with

fibre cables shall be tested for loss test with Optical Time Domain Reflectometer (OTDR) & recording the results.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

#### **H) No Epoxy No polish ST "D" type Multimode Connector (MMA-LIU2)**

**Scope:**

**Specification No (WG-NAS/MMA-LIU2)**

To terminate the optical fibre cables in Lightguide Interconnect Unit (LIU)

**Material:**

**ST "D" type Multimode connector** with Factory pre-polished fibre stub end face consists of bayonet coupling, 2.5mm Zirconium Ferrule, insertion loss < 0.5dB

**Tools to be used:**

Carbide cleaving tool with 30 deg tip (to cut off the fibre to the desired height above the ferrule)

**Method of Construction:**

The no Epoxy no polish connectors field-installed to terminate backbone and distribution cables. The fibre shall be striped, cleaved, inserted into the connector & mechanically secured. The connectors with fibre cable shall be tested for loss test with Optical Time Domain Reflectometer (OTDR) & recording the results.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

#### **I) Power over Ethernet Adaptor (PoEA)**

**General:**

All material shall conform to relevant standard as per IEEE, TIA/EIA.

**Scope:**



**Specification No (WG-NAS/PoEA)**

To provide DC power supply to Ethernet devices, which do not have external/built-in power supply.

**Material:**

**Power over Ethernet Adaptor** with output voltage of 5V DC or 12V DC (selectable) with input of 48V DC consists of Power over Ethernet base unit, Power over terminal unit, AC to DC power adaptor, DC power cable & Ethernet cable.

**Method of Construction:**

Supplying & connecting Power over Ethernet Adaptor with all its connections of base unit, terminal unit & AC to DC power adaptor for supplying power to Access Point, Router or Wireless Ethernet Transceiver complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**J) Tri-Mode Dual band Wireless PCI LAN Card (LANC1)**

**General:**

All material shall conform to relevant standard as per IEEE 802.11 xs.

**Scope:**

**Specification No (WG-NAS/LANC1)**

Making provision of Wireless LAN connectivity for desktop PCs in difficult places where signal strength is low.

**Material:**

**Wireless PCI 32 bit interface LAN card** covering 100 metres (indoor) transmission speed of 108Mbps to connect 802.11b, 802.11g & 802.11a networks operating in two non-interfering bands 2.4 GHz & 5GHz with 4dBi to 5dBi gain Omni directional dipole antenna & driver.

**Method of Construction:**

Supplying & fixing Tri-mode dual band wireless PCI LAN card in desktop computer with installation of driver & configuration for TCP/IP address complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **K) Wireless PCI LAN Card (LANC2)**

#### **General:**

All material shall conform to relevant standard as per IEEE 802.11g.

#### **Scope:**

#### **Specification No (WG-NAS/LANC2)**

Making provision of Wireless LAN connectivity for desktop PCs.

#### **Material:**

**Wireless PCI 32 bit interface LAN card** to connect 802.11g networks operating in 2.4 GHz band covering 100 metres range (indoor), transmission speed of 54Mbps with external dipole antenna, detachable reverse SMA connector & driver.

#### **Method of Construction:**

Supplying & fixing Wireless PCI LAN card in desktop computer with installation of driver & configuration for TCP/IP address complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

### **L) Manageable Wireless LAN Access Point (LAP1)**

#### **General:**

All material shall conform to relevant standard as per IEEE 802.11b/g & IEEE 802.3/u

#### **Scope:**

#### **Specification No (WG-NAS/LAP1)**

To provide wireless access to the WLAN network.

#### **Material:**

**Wireless Access Point** consists of 108Mbps turbo mode handling heavy data payloads, 2dBi gain detachable dipole antenna with reverse SMA connector, external AC to DC 5V adaptor.

**Method of Construction:**

Supplying & connecting Wireless Access Point with AC to DC adaptor to Ethernet switch with due configuration for TCP/IP address complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**M) High Performance Manageable Wireless LAN Access Point with PoE (Power over Ethernet) (LAP2)**

**General:**

All material shall conform to relevant standard as per IEEE 802.11b/g, IEEE 802.3/u & IEEE 802.3af

**Scope:**

**Specification No (WG-NAS/LAP2)**

To provide high performance wireless access to the WLAN network.

**Material:**

**Wireless Access Point** consists of 108Mbps turbo mode handling heavy data payloads, dual 5dBi gain detachable dipole antenna with reverse SMA connectors, Power over Ethernet 10/100 Base-Tx port.

**Note: To connect the Access Point, availability of PoE Ethernet Switch or PoE adaptor is essential.**

**Method of Construction:**

Supplying & connecting Wireless Access Point to PoE Ethernet switch or EthernetSwitch through PoE Adaptor with due configuration for TCP/IP address complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**N) Dual Band High Performance Manageable Wireless LAN Access Point with PoE**

**(Power over Ethernet) (LAN3)**

**Scope:**

**Specification No (WG-NAS/LAP3)**

To provide high performance wireless access to the WLAN network.

**Material:**

**Wireless Access Point** consists of 108Mbps turbo mode handling heavy data payloadsoperating in 2.4 GHz & 5 GHz bands, dual 5dBi gain detachable dipole antenna with reverseSMAconnectors, Power over Ethernet 10/100 Base- Tx port.

**Note: To connect the Access Point, availability of PoE Ethernet Switch or PoEadaptor is essential.**

**Method of Construction:**

Supplying & connecting Wireless Access Point to PoE Ethernet switch or EthernetSwitch through PoE Adaptor with due configuration for TCP/IP address complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis.

**FITTINGS**

**2.1 Lamps FG-LP**

**2.2 Indoor fittings FG-IF**

**2.3 Outdoor fittings FG-OF**

**2.4 Accessories for fittings FG-AS**

**2.5 Brackets for Outdoor fittings FG/BKT**

**2.6 Fans FG-FN**

**2.7 Accessories for Fans No Specs**

**2.8 Drawings**

**Chapter 2 Fittings (FG)**

**2.1 Lamps (FG-LP)**

**A) GLS/MF Lamps (GLS)**

**Specification No (FG-LP/GLS)**

**Scope:**

Supplying and fixing of GLS/MF lamps suitable for 230 volts, and of specified wattage, conforming to IS: 418-1978. The lamp shall meet with the requirements mentioned in Table No. 2.1/1

**Material:**

**Lamp:** Made of blown molten glass, and shall comply with IS: 418-1978.

**Filament:** Made from Tungsten.

**Cap:** Made from high grade Aluminium sheet either Bi pin/Edison screwed.

**Method of Construction:**

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e each)

**Table No. 2.1/1**

**Lamp Data for GLS lamps**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Watts (W)	Filling	Filament	Finish	Luminous flux (lm) at 230 V
25	Vacuum	Single Coil	Clear	220
40				425
60				700
100	1380			
150	2080			
200	2920			
300	Gas filled	Coiled coil		4700
500				8300
1000				18600
1500				29500

### B) Fluorescent tubes (FT)

#### Specification No (FG-LP/FT)

##### Scope:

Supplying and fixing of fluorescent tube suitable for 230 volts, and of specified wattage, conforming to IS: 2418 (Part 1 to 4) - 1977. The lamp shall meet with the requirements mentioned in Table No. 2.1/2

##### Material:

**Lamp:** Based on Tri-phosphor fluorescent powder, with triple coil electrode & anode ring.

**Cap:** Bipin cap made from high grade Aluminium sheet.

##### Method of Construction:

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### Table No. 2.1/2

##### Lamp Data for Fluorescent tubes

Lamp Type	Colour Rendering Index	Colour Temp. (°K)	Lamp watt (W)	Lamp volt (V)	Operating lamp current (A)	Nominal luminous flux (lm)	Life (hrs)
Tri-band phosphor 36 W	82 %	6500	36	103	0.44	3250	15000
	84 %	4000	36	103	0.44	3250	15000
	86 %	2700	36	103	0.44	3250	15000
24 W	85 %	3000	24	-	-	1350	-
	85 %	3400	24	-	-	1350	-
Normal 18 W	54 %	6500	18	58	0.37	1015	-
Normal 36 W	54 %	6500	36	103	0.44	2450	-

### C) High Pressure Mercury Vapour Lamps (MV)

#### Specification No (FG-LP/MV)

#### Scope:

Supplying and fixing of High pressure Mercury vapour lamps suitable for 230 volts, and of specified wattage, conforming to IS: 9900 (Part 1 to 4) - 1981. The lamp shall meet with the requirements mentioned in Table No. 2.1/3

#### Material:

**Lamp:** Hard glass lamp made from high pressure mercury vapour with quartz discharge tube in an ovoid shaped, internally phosphor coated outer shell, with average colour temperature 3800 0K

**Cap:** 3 Pin BC/Screwed cap made from high grade Aluminium sheet.

#### Method of Construction:

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### Table No. 2.1/3

#### Lamp Data for High Pressure Mercury Vapour lamps

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Lamp Type	Colour Temp. (°K)	Lamp watt (W)	Lamp volt (V)	Operating lamp current (A)	Nominal luminous flux (lm)	Starting Time (min.)
HPL-N	3800	80	115	0.80	3500	3.5
HPL-N	3800	125	125	1.15	6250	3.5
HPL-N	3800	250	135	2.0	13500	4.0
HPL-N	3800	400	140	3.2	23000	4.0

### D) ML Blended Lamp/Self Ballasted Lamp (MLL)

#### Specification No (FG-LP/MLL)

#### Scope:

Supplying and fixing of ML Blended lamps suitable for 230 volts, and of specified wattage, conforming to IS: 9900 (Part 1 to 4) - 1981. The lamp shall meet with the requirements mentioned in Table No. 2.1/4

#### Material:

**Lamp:** Hard glass lamp made from high pressure mercury vapour self ballasted with quartz discharge tube in an ovoid shaped, with average colour temperature 3600 0K

**Cap:** 3 Pin BC cap made from high grade Aluminium sheet.

#### Method of Construction:

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### Table No. 2.1/4

#### Lamp Data for High Pressure Mercury Vapour lamps

Lamp Type	Colour Temp. (°K)	Lamp watt (W)	Min. mains Voltage (V)	Lamp current (A)	Nominal luminous flux (lm)	Average life (hrs)
MLL	3600	160	190	0.72	2900	5000

### E) High Pressure Sodium Vapour Lamps (SV)



**Specification No (FG-LP/SV)**

**Scope:**

Supplying and fixing of High pressure Sodium vapour lamps suitable for 230 volts, and of specified wattage, conforming to IS: 9974 (Part 1 & 2) - 1981. The lamp shall meet with the requirements mentioned in Table No. 2.1/5

**Material:**

**Lamp:** High pressure sodium vapour lamps with a polycrystalline translucent Aluminium discharge tube enclosed in an ovoid or tubular outer glass envelope. The ovoid shell shall have internally coated with uniform layer of diffusing powder applied electro statically. The discharge tube shall contain an amalgam of mercury and sodium along with Xenon gas as starting aid.

**Cap:** Screwed cap made from high grade Aluminium sheet.

**Method of Construction:**

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**Table No. 2.1/5**

**Lamp Data for High Pressure Sodium Vapour lamps**

Lamp Type	Lamp watt (W)	Average Lamp volt (V)	Average lamp current (A)	Nominal luminous flux (lm)
SON	70	90	1.0	5800
SON	150	100	1.8	13500
SON-T	150	100	1.8	14000
SON	250	100	3.0	25000
SON-T	250	100	3.0	27000
SON	400	105	4.4	47000
SON-T	400	105	4.4	47500

**F) Metal Halide Lamps (MHL)**

**Specification No (FG-LP/MHL)**

**Scope:**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Supplying and fixing of Metal Halide lamps single/Double ended, suitable for 230 volts, and of specified wattage. The lamp shall meet with the requirements mentioned in Table No.2.1/6

### Material:

**Lamp:** High pressure metal halide gas discharged lamps with iodide additives indium, thallium and sodium in the mercury discharge. The discharge tube shall be enclosed in an oval, hard glass outer bulb with fluorescent coating (HPI-BU) or clear tubular outer hard glass envelope, (HPI-T).

- Colour Temperature : HPI-BU - -> 4300 0K: HPI-T - -> 4300 0K to 4900 0K

**Cap:** Pin type/Screwed cap made from high grade Aluminium sheet.

### Method of Construction:

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**Table No. 2.1/6**

Lamp Type	Lamp watt (W)	Minimum Voltage for Ignition (V)	Average lamp voltage after 100 burning hours (V)	Average lamp current after 100 burning hours (A)	Lamp starting current (A)	CRI (Ra)	Average luminous flux after 100 burning hours (lm)
HPI-BU	250	200	128	2.2	3.2	69	17000
HPI-BU	400	200	125	3.4	6.0	69	30600
HPI-T	70	200	90	1.0	1.4	80	5500
HPI-T	150	200	98	1.8	2.4	85	12100
HPI-T	250	200	128	2.2	3.9	65	17000
HPI-T	400	200	125	3.4	6.0	65	30500

### G) Compact Fluorescent Lamps (CFL)

#### Specification No (FG-LP/CFL)

#### Scope:

Supplying and fixing of Compact Fluorescent lamps either with adapter (Retrofit – InstantStart type) or without (Pin type-PL tube to be used with ballast), suitable for 230 volts, and of specified wattage. The lamp shall have life of 10000

burning hours and shall meet with the requirements mentioned in Table No. 2.1/7. All lamps shall have pf above 0.9.

**Material:**

**Lamp:** Based on fluorescent powder, with electrode.

**Cap:** Pin type/Screwed cap made from high grade Aluminium sheet.

**Method of Construction:**

The lamp shall be fixed at specified location as directed by site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**Table No. 2.1/7**

**Lamp Data for Compact Fluorescent lamps**

Lamp Data for Compact Fluorescent lamps

Mounting type	Lamp watt (W)	Colour Temp. (°K)	Luminous flux (lm)	Efficacy (lm/W)	Average life in (hrs)
Retrofit	13	5000	575	44	10000
Retrofit	13	6000	575	44	10000
Retrofit	13	2700	550	42	10000
Retrofit	18	5000	850	47	10000
Retrofit	18	6000	850	47	10000
Retrofit	18	2700	800	45	10000
Retrofit	25	5000	1100	44	10000
Retrofit	25	6000	1100	44	10000
Retrofit	25	2700	1050	42	10000
PL	9	2700	400	44	10000
PL	11	2700	600	55	10000
PL	15	2700	900	60	10000
PL	15	5000	800	53	10000
PL	20	2700	1200	60	10000
PL	20	5000	1100	55	10000
PL	23	2700	1500	65	10000
PL	23	5000	1350	59	10000
PL	5	2700	250	50	8000
PL	5	4000	250	50	8000
PL	7	2700	400	57	8000
PL	7	4000	400	57	8000
PL	11	4000	900	91	8000

**2.2 Indoor fittings (FG/IDF)**

**A) Bulkhead Fitting**

**Scope:**

**Specification No (FG-IDF/BHF)**

Supplying and erecting bulkhead fitting with fine finished cast Aluminium enamelpainted body with 20 mm conduit entry and clear glass / prismatic glass with guard and complete water tight hinged with locking screw porcelain holder to house CFL up to 5/9/11 Watt erected in position on polished double wooden block.

**Material:**

***Bulkhead fitting:***

Bulk Head Fitting shall be made from pressure die-cast aluminium LM6 body in stove enamel finish and fitted with a heat resistant elegant glass cover through a gasket. A two pin BC porcelain holder for GLS or a CFL holder shall be fitted inside the housing. An electro-galvanized MS wire guard for protection against pilferage. Glass and wire guard assembly shall be hinged to the body for ease of maintenance. The bulkhead shall be suitable for Integral type CFL, with cable entry through one no. 3/4" B.S. threaded inlet. Incoming wires shall be terminated on the lamp holder terminals in case of GLS and in the terminal block in case of CFL. Two lugs with slots for facilitating wall/ceiling mounting. The fitting shall be I.P.54 protected.

**Wooden board:** As per **(WG-PW/PW)** 1.6 specified in chapter for Point wiring.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Method of Construction:**

The Bulkhead shall be mounted on polished double wooden block with required size of SM screws, duly wired.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**B) Mirror Light Fitting Suitable for CFL 9/13/18 watts (ML1)**

**Scope:**

**Specification No (FG-IDF/ML1)**

Supplying and erecting luminaries suitable for 9/13/18 watt CFL lamp made of engineering Plastic in approved colour finish and an elegantly designed milky

white acrylic front diffuser, and bright anodized Aluminium reflector, with VPIT ballast, lampholder, and connector.

**Material:**

**Fitting:**

The Luminaries Comprises housing made of engineering plastic in approved colour finish and an elegantly designed white acrylic front diffuser enclosing a bright anodized Aluminium reflector. Pre-wired with vacuum pressure impregnated copper ballast, lamp holder and mains connector with two holes on rear side facilitates wall/ceiling mountings, the grommet should be provided at rear side.

**Wooden board:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

**Connection Wire:** Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Method of Construction:**

The fitting shall be mounted on polished Wooden / Laminated 4mm plywood top / block by required size of screws with necessary flexible wire for connection.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**C) Mirror Light Fitting Suitable for CFL 9 watts (ML2)**

**Scope:**

**Specification No (FG-IDF/ML2)**

Supplying and erecting Mirror light fitting with 1 x 9 Watts CFL, with necessary Choke & accessories complete erected on polished wooden / sunmica block.

**Material:**

**Fitting:**

Channel fabricated from CRCA MS sheet and finished in reflector white inside and outside. Pre-wired with vacuum pressure impregnated copper ballast, lamp holder and mains connector, and an aesthetically appealing serrated / reeded opal diffuser held in position by decorative end covers white (W) / deep blue (B) / orange (O) / H.C.grey (G), post office red (R) / Black (BK) or approved colour, 12mm dia grommet. Two 6.5 mm dia holes on the rear side of the channel to facilitate wall / ceiling mounting.

**Wooden board:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Connection wire:** Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

#### **Method of Construction:**

The fitting shall be mounted on polished Wooden / Laminated 4mm plywood top / block by required size of screws with necessary flexible wire for connection.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### **D) Mirror Optic Recessed down Lighter suitable for 2 x 18 watts CFL (DL1)**

##### **Scope:**

##### **Specification No (FG-IDF/DL1)**

Supplying and erecting circular type recessed down lighter suitable for 2x18 watts CFL, including gear box. The luminaire comprises a ceiling ring spun from Aluminium attached to mounting unit made of mild steel. The mounting unit has a pair of sliding brackets for fixing the luminaire to the ceiling.

##### **Material:**

##### **Fitting:**

Scientifically designed highly polished & anodized Aluminum reflector ensures precise light control with optimum light utilization, leading to substantial savings

in energy cost and excellent ambient conditions. Reflector is fitted into the frame with decorative screw arrangement. Frame is fabricated from CRCA MS sheet and epoxy powder coated white. Precoated frame ensure corrosion free life. Fitting shall have a prismatic acrylic diffuser resting on upper part of reflector to reduce glare. Retaining clips facilitate mounting in false ceilings.

**Ballast:** As per **(FG-FG/AS1)** specified in chapter 2.4.

**Bi-pin lamp holder:** Conforming to IS: 3323/80 with amendment No.1 to the extent possible / applicable.

**Capacitor / Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

#### **Method of Construction:**

The fitting shall be fixed firmly in the designated place (False ceiling / unspecified ceiling) with the help of swinging bracket, and making the connection. In case where fittings are to be installed flush with / on false ceiling; layout shall be given to civil wing and work shall be done in co-ordination with civil wing e.g. making recesses in false ceiling.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### **E) Mirror Optic CFL fitting (MOF)**

**Scope:**

**Specification No (FG-IDF/MOF)**

Supplying & erecting recessed / surface down lighter with mirror optics suitable for specified wattage of CFL.

**Material:**

**Fitting:**

Housing fabricated from CRCA sheet, epoxy powder coated, white enamelled, with mirror assembly comprising of significantly designed high purity aluminium reflector for high optical performance back wing light and with improved vertical illumination.

**Ballast:** As per **(FG-FG/AS1)** specified in chapter 2.4.

**Bi-pin lamp holder:** Conforming to IS: 3323/80 with amendment No.1 to the extent possible / applicable.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Chain:** Heavy duty lacquered MS chain with hooks.

**Block:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

#### **Method of Construction:**

Mirror optic fitting suitable for specified wattage of CFL complete erected on wooden block/PVC block / on ceiling directly in case of surface mounting fitting, as directed by site engineer, with necessary screws of suitable size, with rawl plugs, gutties, etc. In case of recesses mounting, the fitting shall be secured and erected by fixing the hook at ceiling, and the chain shall be fixed to the fitting, in such a manner that the fitting shall be in level with the designated place (false / unspecified ceiling)

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### **F) Box type Fluorescent fitting (BFF)**

**Scope:**

**Specification No (FG-IDF/BFF)**

Supplying & erecting white stove enamelled / powder coated box type fluorescent fitting suitable for T 8 tube/ tubes, with specified ballast, and necessary accessories, duly wired up for use on 250 V AC, supply and erected if



required on varnished wooden / PVC block with flexible wire, twin core 24/0.20 mm. and with necessary materials complete and marking Sr. No. and date of erection.

**Material:**

**Fitting:**

White stove enameled / powder coated box type fluorescent fitting suitable for T 8 tube, made of CRCA sheet not less than 0.5 mm thick, painted white on the reflector side and gray/any other colour (specified by the Engineer in-charge) on other surface. Wire ways shall be smooth & free from sharp edges, burrs, flashes & like which might cause abrasion of the insulation of the wiring. Parts such as metal set screws shall not protrude into wire ways. Fitting shall be duly wired up internally with appropriate size of wire.

**Ballast:** As per **(FG-FG/AS2) / (FG-FG/AS3) / (FG-FG/AS4)** specified in chapter 2.4.

**Tube holders:** As per **(FG-FG/AS8)** specified in chapter 2.4

**Starter:** As per **(FG-FG/AS11)** specified in chapter 2.4

**Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4

**Starter holder:** As per **(FG-FG/AS9)** specified in chapter 2.4

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Paint:** Superior quality enamel paint of specified colour.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Chain:** Heavy duty lacquered MS chain with hooks.

**Down Rod:** Steel conduit as per **(WG-MA/CON)** specified in chapter for Point wiring.

**Block:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Method of Construction:**

The complete fitting with all the above accessories shall be fixed on wooden / PVC block with SM screws (minimum size shall be 25x8 mm). The wooden/PVC block shall be fixed on wall/ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. S. No and date of erection shall be painted/ marked by enamel paint. The fitting shall be connected with PVC insulated copper wire leads, to the point and testing shall be carried out.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

### **G) Chalk Board type Fluorescent fitting (CBF)**

**Scope:**

#### **Specification No (FG-IDF/CBF)**

Supplying & erecting white stove enameled / powder coated Chalk board type fluorescent fitting with enameled reflector of 0.8 mm thick, white on the reflector side and gray on other surface suitable for T 8 tube/ tubes, with specified ballast, and necessary accessories, duly wired up for use on 250 V AC, supply including material required for erection and erection as per requirement complete and marking Sr. No. and date of erection.

**Material:**

**Fitting:**

White stove enameled / powder coated Chalk board type fluorescent fitting suitable for T 8 tube, made of CRCA sheet not less than 0.5 mm thick, with enameled reflector of 0.8 mm thick, painted white on the reflector side and gray on other surface. Wire ways shall be smooth & free from sharp edges, burrs, flashes & like which might cause abrasion of the insulation of the wiring. Parts such as metal set screws shall not protrude into wire ways. Fitting shall be duly wired up internally with appropriate size of wire.

**Ballast:** As per (FG-FG/AS2) / (FG-FG/AS3) / (FG-FG/AS4) specified in chapter 2.4.

**Tube holders:** As per (FG-FG/AS8) specified in chapter 2.4

**Starter:** As per (FG-FG/AS11) specified in chapter 2.4

**Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4

**Starter holder:** As per **(FG-FG/AS9)** specified in chapter 2.4

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Paint:** Superior quality enamel paint of specified colour.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Block/ Board:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

### **Method of Construction:**

The complete fitting with all the above accessories shall be fixed on wooden / PVC block with SM screws (minimum size shall be 25x8 mm). The wooden/PVC block shall be fixed on wall/ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. S. No and date of erection shall be marked/painted by enamel paint. The fitting shall be connected PVC copper wire leads, to the point and testing shall be carried out.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

## **H) Industrial type Fluorescent fitting (INF)**

### **Scope:**

### **Specification No (FG-IDF/INF)**

Supplying & erecting white stove enameled / powder coated Industrial type fluorescent fitting with enameled reflector of 0.8 mm thick, white on the reflector side and gray on other surface suitable for T 8 tube/ tubes, with specified ballast, and necessary accessories, duly wired up for use on 250 V AC, supply including material required for erection and erecting as per requirement complete and marking Sr. No. and date of erection.

### **Material:**

### **Fitting:**

White stove enameled / powder coated Industrial type fluorescent fitting suitable for T-8tube, made of CRCA sheet not less than 0.5 mm thick, with enameled reflector of 0.8 mmthick, painted white on the reflector side and gray on other surface. Wire ways shall be smooth & free from sharp edges, burrs, flashes & like which might cause abrasion of the insulation of the wiring. Parts such as metal set screws shall not protrude into wire ways. Fitting shall be duly wired up internally with appropriate size of wire. (Refer drawing no.IDF-1 (Fig.3))

**Ballast:** As per **(FG-FG/AS2) / (FG-FG/AS3) / (FG-FG/AS4)** specified in chapter 2.4.

**Tube holders:** As per **(FG-FG/AS8)** specified in chapter 2.4

**Starter:** As per **(FG-FG/AS11)** specified in chapter 2.4

**Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4

**Starter holder:** As per **(FG-FG/AS9)** specified in chapter 2.4

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Paint:** Superior quality enamel paint of specified colour for marking.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Block:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

### **Method of Construction:**

The complete fitting with all the above accessories duly wired up shall be fixed on block with SM screws (minimum size shall be 25x8 mm). The block shall be fixed on wall/ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. The fitting if, to be ceiling suspended, it shall be fixed to the provided 16 SWG 20 mm dia., HGD conduit duly threaded in ball suspension plate. The provided ball suspension plate shall be fixed on block with SM screws (minimum size shall be 25x8 mm) and the block shall be fixed at ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. S. No and date of erection shall be marked/painted by enamel

paint. The fittings shall be connected with PVC insulated copper wire leads, to the point and testing shall be carried out.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

### **I) Recess /Surface mounting Mirror Optic Fluorescent Fitting (MOP)**

**Scope:**

#### **Specification No (FG-IDF/MOP)**

Supplying & erecting white stove enameled / powder coated Mirror Optic type fluorescent fitting with enameled reflector of 0.8 mm thick, white on the reflector side and gray on other surface suitable for T 8 tube/ tubes, with specified ballast, and necessary accessories, duly wired up for use on 250 V AC, supply including material required for erection and erecting as per requirement complete and marking Sr. No. and date of erection.

**Material:**

**Fitting:**

White stove enameled / powder coated recess /surface mounting mirror optic type fluorescent fitting suitable for T 8 tube, made of CRCA sheet not less than 0.5 mm thick, painted white on the reflector side and gray on other surface, and with Mirror assembly comprising of significantly designed high purity aluminium reflector for high optical performance. Wire ways shall be smooth & free from sharp edges, burrs, flashes & like which might cause abrasion of the insulation of the wiring. Parts such as metal set screws shall not protrude into wire ways. Fitting shall be duly wired up internally with appropriate size of wire. (Refer drawing no.IDF-2 (Fig.4 & Fig.5))

**Ballast:** As per (FG-FG/AS2) / (FG-FG/AS3) / (FG-FG/AS4) specified in chapter 2.4.

**Tube holders:** As per (FG-FG/AS8) specified in chapter 2.4

**Starter:** As per (FG-FG/AS11) specified in chapter 2.4

**Condenser:** As per (FG-FG/AS7) specified in chapter 2.4

**Starter holder:** As per (FG-FG/AS9) specified in chapter 2.4

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Paint:** Superior quality enamel paint of specified colour.

**Hardware:** Sheet Metal (SM) screws, washers, plugs / wooden gutties, etc.

**Chain:** Heavy duty lacquered MS chain with hooks.

**Down Rod:** As per **(WG-MA/CON)** specified in chapter for Point wiring.

**Block:** As per 1.6 specified in chapter for Point wiring. **(WG-PW/PW)**

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

### **Method of Construction:**

The complete fitting with all the above accessories shall be fixed on wooden / PVC block / on provided chain / down rod with ball suspension plate with SM screws (minimum size shall be 25x8 mm). The wooden/PVC block shall be fixed on wall/ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. The fitting if, to be ceiling suspended, it shall be fixed to the provided 16 SWG 20 mm dia., HG conduit duly threaded in ball suspension plate. The provided ball suspension plate shall be fixed in wooden / PVC block with SM screws (minimum size shall be 25x8 mm). The wooden/PVC block shall be fixed at ceiling with SM screws (minimum size shall be 75x8mm) with necessary plugs, gutties, etc. In case of recesses mounting, the fitting shall be secured and erected by fixing the hook at ceiling, and the chain shall be fixed to the fitting, in such a manner that the fitting shall be in level with the false / unspecified ceiling. Sr. No and date of erection shall be marked or painted by enamel paint. The fitting shall be connected PVC copper wire leads, to the point and testing shall be carried out.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

### **2.3 Outdoor fittings (FG/ODF)**

#### **A) Street Light fitting suitable for CFL (CSL)**

**Scope:**

**Specification No (FG-ODF/CSL)**

Supplying & erecting Street Light suitable for specified wattage of CFL complete with serrated acrylic diffuser & gasket, with necessary control gear and erected on provided bracket.

**Material:**

**Fitting:**

The fitting canopy shall be made of deep drawn of CRCA Sheet, powder coated / epoxy powder coated CRCA sheet housing with epoxy white powder coated CRCA sheet steel gray tray covered with anodized Aluminium reflector wired with a provision for housing open construction ballast required for specified wattage of CFL with clear acrylic cover with rubber gasket fixed by 4 Nos. toggles of suitable OD entry for direct mounting pipe bracket. Fitting shall be with degree of protection IP 54 electrical Safety Class-I. Fitting shall be duly wired up internally with appropriate size of wire. (Refer drawing no. ODF-1 (Fig.1 & Fig.2 )

**Ballast:** As per **(FG-FG/AS1)** specified in chapter 2.4.

**Bi-pin lamp holder:** Conforming to IS: 3323/80 with amendment No.1 to the extent possible / applicable.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

**Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided bracket, on wall/street light pole or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**B) Street Light fitting suitable for HPMV/HPSV/MH Lamps (GSL)**

**Scope:**

**Specification No (FG-ODF/GSL)**

Supplying & erecting Street Light fitting suitable for specified wattage of HPSV/HPMV/MHlamps, with all accessories, erected with provided bracket on wall/street light pole or at any place as directed by Site engineer with necessary materials.

**Material:**

**Fitting:**

The fitting comprises deep drawn one piece Aluminium body. Lamp compartment has stoveenamel white finish from inside & gray finish from outside. nickel chrome plated reflector /Aluminium reflector is mounted inside the lamp compartment for high optical efficiency control gear compartment houses a detachable gear tray & is wired with provided copperwound ballast, power factor improvement capacitor, electronic ignitor & with mains connector. The cable entry is through mounting pipe & terminated on mains connector inside the control gear housing with felt gasket which ensures weather proofness & also prevents entry of insects inside the housing. The fittings lamp compartment shall have IP43 protection & IP 23 protection for control gear compartment. The fitting shall be ISI marked to IS: 10322 part -5: 1987 with Amendment No.1&2 and comply with requirements of IS: 10322: part-5/Sec-1:1985 with Amendment No.1&2 IS: 13383: part 2: 1992 with Amendment No.1. Fitting shall be duly wired up internally with appropriate size of wire.

(Refer drawing no.ODF-2 (Fig.3))

**Ballast:** As per **(FG-FG/AS5)** specified in chapter 2.4

**Ignitor:** As per **(FG-FG/AS6)** specified in chapter 2.4

**Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

**Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided bracket, on wall/street light pole or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)



### **C) Street Light fitting suitable for T 8 Fluorescent tubes (FSL1)**

#### **Scope:**

#### **Specification No (FG-ODF/FSL1)**

Supplying & erecting Street Light suitable for specified wattage complete with serrated acrylic diffuser & gasket, with necessary control gear and erected on provided bracket.

#### **Material:**

#### **Fitting:**

ISI marked Fluorescent Street light fittings complete with electronic ballast, transparent cover made out of 3mm thick acrylic sheet, gear cum reflector tray, canopy and lampholder duly wired for use on 240 volt AC single phase 50 Hz without fluorescent lamp. Canopy shall be made of Aluminium sheet 1.25 mm thick minimum. Gear cum reflector tray (GCRT) shall be made of either CRCA sheet of 0.8 mm thick or Aluminium sheet of 1.25 mm thick. Fitting shall be suitable for mounting up to a height of 15 meters and shall be able to withstand wind load test. It shall conform to class-1 of IS: 10322 (part 5/sec 3)/87 with amendment 1 and IP-53 protection with photometric test requirement with luminous efficiency not less than 65%.

i) Various components of fittings shall conform to IS specification as noted below.

a) Electronic ballast (EB) to IS: 13021: Part-1:1991 with Amendment No.1, IS: 13021:Part-2:1991 with Amendment Nos.1 and 2 and additional requirement as per the

b) Bi-pin lamp holders to IS: 3323/80 with amendment No.1/

c) PVC cables to IS: 694/90 with amdt.No.1 & 2.

ii) Surface of CRCA Steel and Aluminium sheets used shall be properly phosphatized and stove enamelled white on the reflector side, tray side and other surface stove enamelled grey.

iii) The street light fittings shall be required with socket bore of 30mm or 40 mm or 50mm for side entry/top entry type fittings. The socket bore, however, will be specified by the indenters at the time of placement of supply order.

iv) All wire leads to be adequately covered with sleeves for protection against accidental contacts.

v) All hardware parts used should be zinc coated or nickel/chromium plated so as to be corrosion resistant.

vi) Fitting shall be wired with multi-stranded copper wire terminating on suitable connectors. The wiring shall be properly clamped.

**Ballast:** As per **(FG-FG/AS1)** specified in chapter 2.4.

**Bi-pin lamp holder:** Conforming to IS: 3323/80 with amendment No.1 to the extent possible / applicable.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm ISI marked.

**Terminal connector:** As per **(FG-FG/AS10)** specified in chapter 2.4.

#### **Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided bracket, on wall/street light pole or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

#### **D) Energy efficient T-5 2X14 & 2X24 Street Light fitting (FSL2)**

##### **Scope:**

##### **Specification No (FG-ODF/FSL2)**

Supplying & erecting Energy efficient T-5 2X14 & 2X24 Street Light fittings suitable for specified wattage of T-5 lamp complete with serrated acrylic diffuser & gasket, with necessary control gear and erected on provided bracket.

##### **Material:**

##### **Fitting:**

ISI marked Energy efficient T-5 2X14 & 2X24 Street Light fitting complete with electronic ballast, transparent cover made out of 3mm thick acrylic sheet, gear

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

cum reflector tray, canopy and lamp holder duly wired for use on 240 volt AC single phase 50 Hz without T-5 lamp. Canopy shall be made of Aluminium sheet of width 3" minimum per lamp. Gear cum reflector tray (GCRT) shall be made of either CRCA sheet of 0.8 mm thick or Aluminium sheet of 1.25 mm thick. Fitting shall be suitable for mounting up to a height of 15 meters and shall be able to withstand wind load test. It shall conform to class-1 of IS: 10322 (part 5/sec 3)/87 with amendment 1 and IP-65 protection

i) Various components of fittings shall conform to IS specification as noted below.

a) Electronic ballast (EB) to IS: 13021: Part-1:1991 with Amendment No.1, IS: 13021:Part-2:1991 with Amendment Nos.1 and 2 and additional requirement as per the

b) Bi-pin lamp holders to IS: 3323/80 with amendment No.1/

c) PVC cables to IS: 694/90 with amdt.No.1 & 2.

ii) Surface of CRCA Steel and Aluminium sheets used shall be properly phosphatized and stove enamelled white on the reflector side, tray side and other surface stove enamelled grey.

iii) The street light fittings shall be required with socket bore of 30mm or 40 mm or 50mm for side entry/top entry type fittings. The socket bore, however, will be specified by the indenters at the time of placement of supply order.

iv) All wire leads to be adequately covered with sleeves for protection against accidental contacts.

v) All hardware parts used should be zinc coated or nickel/chromium plated so as to be corrosion resistant.

vi) Fitting shall be wired with multi-stranded copper wire terminating on suitable connectors. The wiring shall be properly clamped.

### **Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided bracket, on wall/street light pole or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

## **E) Flood Light fitting suitable for HPMV/HPSV/MH Lamps (GFL)**

### **Scope:**

### **Specification No (FG-ODF/GFL)**

Supplying & erecting Flood Light fitting suitable for specified wattage of HPSV/HPMV/MH lamps, with all accessories, erected with provided bracket on wall/street light pole or at any place as directed by Site engineer with necessary materials.

### **Material:**

### **Fitting:**

Luminaries comprising of a die cast aluminium housing with store enamel finish. A flattoughened heat resistance glass is firmly fixed with a synthetic rubber gasket to the housing by stainless steel toggles. Control gear comprises of provided copper wound ballast, power factor improvement capacitor, and electronic ignitor & with mains connector. Luminaire shall be mounted on a MS cradle for rotating in horizontal & vertical planes for facilitating positioning of the luminaire to effectively illuminate the target area. Brightened & anodized aluminium reflector for high optical efficiency. Cable entry shall be through suitable cable glands/ nipple provided for cable entry. (Refer drawing no. ODF-2 (Fig.4))

**Ballast:** As per (FG-FG/AS5) specified in chapter 2.4

**Ignitor:** As per (FG-FG/AS6) specified in chapter 2.4

**Condenser:** As per (FG-FG/AS7) specified in chapter 2.4

**Terminal connector:** As per (FG-FG/AS10) specified in chapter 2.4.

### **Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided bracket, on wall/street light pole or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.each)

## **F) Gate Light fitting (PTL) suitable for HPMV/HPSV/MH Lamps (PTL)**

**Scope:**

### **Specification No (FG-ODF/PTL)**

Supplying and erecting Gate light fitting suitable for specified wattage of HPMV/SV/MHlamp/lamps, complete with control gear, duly wire and erected on provided pipe/pole or at any other place, as directed by site engineer.

**Material:**

### **Fitting:**

The fitting comprising of a control gear capsule made of die cast aluminium alloy and shall have provision for fixing of control gear. Fitting shall have acrylic bowl with ushroom/roundshape bowl of specified diameter, and shall be fixed on the top of the capsule. The bowl shall be adequately gasketed for weather proofness. The inner diameter of control gear capsule base shall be suitable for pipe of 50 mm to 77 mm O.D. Fitting shall have entry for termination of cable. The control gear capsule shall have IP 43 protection class. (Refer drawing no.ODF-2 (Fig.5))

**Ballast:** As per (FG-FG/AS5) specified in chapter 2.4

**Ignitor:** As per (FG-FG/AS6) specified in chapter 2.4

**Condenser:** As per (FG-FG/AS7) specified in chapter 2.4

**Terminal connector:** As per (FG-FG/AS10) specified in chapter 2.4.

### **Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided pole/pipe or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.each)

**G) Gate / Garden Light fitting suitable for CFL (GLT)**

**Scope:**

**Specification No (FG-ODF/GLT)**

Supplying and erecting Gate / Garden light fitting suitable for specified wattage of CFL (One or Two), complete with control gear, duly wire and erected on provided pipe/pole or at any other place, as directed by site engineer.

**Material:**

**Fitting:**

The fitting comprising of a control gear capsule made of die cast aluminium alloy and shall have provision for fixing of control gear. Fitting shall have acrylic bowl with mushroom/round shape bowl of specified diameter, and shall be fixed on the top of the capsule. The bowl shall be adequately gasketed for weather proofness. The inner diameter of control gear capsule base shall be suitable for pipe of 50 mm to 77 mm O.D. Fitting shall have entry for termination of cable. The control gear capsule shall have IP 43 protection class.

**Ballast:** As per (FG-FG/AS5) specified in chapter 2.4

**Ignitor:** As per (FG-FG/AS6) specified in chapter 2.4

**Condenser:** As per (FG-FG/AS7) specified in chapter 2.4

**Terminal connector:** As per (FG-FG/AS10) specified in chapter 2.4.

**Method of Construction:**

The complete fitting with all the above accessories shall be erected with provided pole/pipe or at any place as directed by Site engineer, duly connected and giving necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis.  
(i.e.

each)

## **2.4 Accessories for fittings (FG/AS)**

### **Specifications for Ballasts / Ignitor / Condenser**

#### **Scope:**

This chapter deals with supply, erection and connecting the accessories required in various

types of fittings suitable for fluorescent tubes, HPMV/SV/MH lamps, etc., and giving

necessary testing of the fittings after erecting the accessory.

#### **Specification No (FG-FG/AS1)**

##### **1. CFL Ballast:**

Ballast shall be copper wire wound, polyester filled or vacuum impregnated type suitable for

Compact fluorescent lamp (CFL) conforming to I.S. 1534 with amendment No. 1 to 4

suitable for use on 230 V, 50 Hz, Single phase AC Supply, Temperature rise for ballast

shall be 50 degree C, above the ambient temperature under normal conditions, minimum

preheating current shall be 153 milliamp at 90 % of rated voltage and maximum 240

milliamp at 110 % of the rated voltage.

#### **Specification No (FG-FG/AS2)**

##### **2. Electromagnetic Ballast for T 8 fluorescent tubes:**

The ballast shall be of self Inductive coil of super enamelled copper low loss silicon steel

lamination inductive coil with or without as additional resistor, designed to give operational

characteristics for 40 W, at rated voltage of 220 V to 240V with calibration current 0.43 A.,

conforming to IS: 1534. Air temperature of the ballast winding shall not exceed 250

C above ambient, with appropriate IP protection class.

### **Specification No (FG-FG/AS3)**

#### **3. Electronic Ballast for T 8 fluorescent tubes:**

The High frequency electronic ballast suitable for T 8 tube shall have circuit P.F of 0.95 /

protected against mains disturbances, automatic cut off protection for a deactivated tube,

glass fuse in main input circuitry, short circuit protection for a limited duration for both PCB

terminals and components. Should withstand 1.5 KV AC high voltage for insulation as per

IS 1302/ Part I. Terminal block should be provided for mains and lamp connections,

separate earthing terminal & tamper proof warrantee seal, the losses should not be more

than 4 watts & without humming noise.

### **Specification No (FG-FG/AS4)**

#### **4. VPIT Ballast T 8 fluorescent tubes:**

Vacuum impregnated low loss copper ballast made of low loss silicon steel lamination with

super enamelled copper wire, vacuum impregnated with white resin, two way terminal block

and winding temperature limited to 1200C, conforming to IS 1534 (Part -1 of 1977) and

suitable for 240 Volt 50 Hz, AC supply.



**Specification No (FG-FG/AS5)**

**5. Ballast for HPMV/SV and Metal Halide Lamps:**

Ballast shall confirm to IS: 6616/82 with the following variations. The ballast shall be

marked with watt loss and at rated voltage power delivered shall be between 92.5% and

107.5% of the power delivered by the reference ballast.

Ballast used in the fittings shall be energy efficient where watt loss will not exceed the

following limits:-

***Ballast for 70 Watts Lamp : 15 Watts max.***

***Ballast for 150 Watts Lamp : 19 Watts max.***

***Ballast for 250 Watts Lamp : 26 Watts max.***

***Ballast for 400 Watts Lamp : 38 Watts max.***

Winding Resistance shall be within a Tolerance of +5% & 10 % on values declared by the

manufacturer.

**Specification No (FG-FG/AS6)**

**6. Ignitor:**

Ignitor shall be suitable for HPSV/MV and Metal Halide lamps. It shall not pulsate after the

lamp has been fully ignited. Ignitor improper connection shall not cause any deleterious

effects on the luminaries. The components shall be fitted inside the polypropylene,

insulating container. Necessary wires with standard colour coding (Red, yellow & Black),

shall be drawn outside the container for facilitating the connections.

**Specification No (FG-FG/AS7)**

**7. Condenser / Capacitor:**

Made of Metallized Polypropylene (MPP) housed in a polypropylene container, hermetically

sealed designed for tropical conditions, of appropriate capacity conforming to IS: 1569 of

1976 used for P.F improvement not less than 0.9 for all types of luminaries or other

appliances. Condenser shall be connected across the mains or in series with one ballast

for lead / lag circuit.

**Specification No (FG-FG/AS8)**

**8. Tube holders:**

Lamp holder should be designed for tubular fluorescent T 8 lamps for all wattages, for end

to end mounting, rotary locking type. The holder shall conform to IS: 3323 of 1980.

**Specification No (FG-FG/AS9)**

**9. Starter holder:**

Starter holder made from PVC with copper contacts, and groove for securely holding the

starter. The starter holder shall conform to IS: 2215/1984.

**Specification No (FG-FG/AS10)**

**10. Terminal connector:**

Connector shall be made of Porcelain / Bakelite / PVC, with necessary brass / copper

contacts, screws for connections. The nominal cross sectional area of the connector shall

be suitable for leads of 2.5 mm<sup>2</sup>.

**Specification No (FG-FG/AS11)**

**11. Starter:**

Starter made of bi-metallic glow switch housed in polypropylene can with plastic cover and

brass pins, with radio interference suppression capacitors and heavy gauge nickel plated

brass contact, conforming to IS 2215 of 1983. Starter shall be suitable for fixing in all types

of starter holders.

**Method of Construction:**

The above accessories shall be fixed in the fitting, duly wired and necessary testing shall

be carried out in presence of site engineer.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

**2.5 Brackets for Outdoor fittings (BKT)**

**A) Bracket welded to Pole Cap (BKT/BPC)**

**Scope:**

**Specification No (FG-BKT/BPC)**

Fabrication of Street light bracket of specified diameter 'B' class G.I. Pipe, of specified length welded to pole cap erected on top of the pole for erection of either single /

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

double, side entry WP fluorescent/CFL/MV/MH/SV fitting(s), duly painted with one coat of

red oxide & one coat of Aluminium paint, and erecting the same with provided leads.

### **Material:**

**GI Pipe:** GI Pipe of specified diameter as per **(CW-PLB/GP)** mentioned in chapter

17.5

**Pole Cap:** Pole cap fabricated from 4 mm thick MS Sheet, of 30 cm in length.

**Corner support:** 3 mm thick MS flat / sheet

**Set screws:** MS bolts, nuts of 6 mm dia.

**Paint:** Red oxide & Aluminium paint.

### **Method of Construction:**

The bracket shall be fabricated **as per drawing No(s) BKT-1 ( Fig.1 Fig.3), BKT-2 (Fig.4, Fig.5)** and shall be placed on the pole cap. Inner diameter of pole cap shall be as

per the outer diameter of pole with sufficient clearance, so as to facilitate easy placing

of the cap on top of pole. Two holes of minimum 6 mm diameter shall be drilled to pole

cap. The nuts shall be placed on the pole cap duly aligned with the hole, and shall be butt

welded. Bolts shall then be tightened through the nut so as to hold the bracket in vertical

position.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **B) Wall Bracket (BKT/WB)**

### **Scope:**

#### **Specification No (FG-BKT/WB)**

Fabrication of Street light bracket of specified diameter 'B' class G.I. Pipe, 1.2 m in length

erected on wall for erection of side entry WP fluorescent/CFL/MV/MH/SV fitting(s), duly

painted with one coat of red oxide & one coat of Aluminium paint, and duly connected to

supply with PVC wire leads.

### **Material:**

**GI Pipe:** GI Pipe of specified diameter as per **(CW-PLB/GP)** mentioned in chapter

17.5

**Hardware:** Grouting MS bolts, nuts of 10 mm dia. & 100 mm length. 'U' shaped clamps of

suitable diameter made of GI.

**MS Flat:** MS flat 3 mm thick 50 mm wide

**Paint:** Red oxide & Aluminium paint.

**Wire leads:** 1.5 mm<sup>2</sup>, as per **(WG-MA/BW)** mentioned in chapter 1.3

**Miscellaneous:** Cement, Sand, Water, etc.

### **Method of Construction:**

The bracket fabricated [as per drawing No BKT- 1 \(Fig.2\)](#) shall be erected on wall as explained below:

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

- MS flat of length 15 cm with 10 mm diameter hole shall be welded to the pipe as shown in

drawing.

- Grouting bolts shall be grouted in wall and finished with cement plaster.
- Bracket shall be placed on the grouted bolts with clamps and nut shall be tightened.
- Fitting shall then be inserted onto the bracket and connections shall be made.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

### **C) Street Light Bracket (BKT/SLB)**

**Scope:**

**Specification No (FG-BKT/WB)**

Fabrication of Street light bracket of specified diameter 'B' class G.I. Pipe, of required

length erected on pole for erection of side entry WP fluorescent/CFL/MV/MH/SV fitting(s),

duly painted with one coat of red oxide & one coat of Aluminium paint, and duly connected

to supply with PVC wire leads.

**Material:**

**GI Pipe:** GI Pipe of specified diameter as per **(CW-PLB/GP)** mentioned in chapter

17.5

**Hardware:** MS nuts & bolts, Rubber Grommet.

**MS Flat:** MS sheet 5 mm thick 40 mm wide.

**Paint:** Red oxide & Aluminium paint.

**Wire leads:** 1.5 mm<sup>2</sup>, as per **(WG-MA/BW)** mentioned in chapter 1.3

**Method of Construction:**

The bracket fabricated as per drawing no BKT-2 (Fig.6) , shall be erected on pole as explained below:

- Clamps of required length shall be fabricated as per outer diameter of pole and the pipe

used for bracket.

- Bracket shall be clamped with the pole and the nuts bolts shall be tightened so as to keep

bracket in plum.

- Hole for drawing the mains wire shall be drilled just below the bracket. The grommet shall

be placed and the wires shall then be drawn.

- Fitting shall then be inserted onto the bracket and connections shall be made.

**Mode of Measurement:** Executed quantity shall be measured on running metre basis of

the pipe used. (i.e. each)

**2.6 Fans (FG/FN)**

**A) Ceiling Fans**

**Scope:**

**Specification No (FG-FN/CF)**

Supplying and erecting Ceiling fan of specified sweep with all accessories and necessary materials, erected in provided hook/clamp.

**Material:**

**Ceiling Fan:**

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Electric Ceiling fan capacitor type with double ball bearing complete with capacitor, 300 mm

down rod, canopies, shackles, reel insulator, half threaded bolts of 9.53 mm (3/8") dia 62.5

mm (2-1/2") to 88 mm (3-1/2") long and 7.94 mm (5/16") dia 44.5 mm (1-3/4") to 57 mm (2-1/4") long with nuts, with lock type split pin, spring & plate washers, etc.; three number

blade made of Aluminium alloy, suitable for single phase, AC 210 volts, 50 Hz supply and

conforming to class I of IS : 374/1979 with amendment no 1 to 6 except for performance

parameters to the extent modified as details in general requirements. The down rod shall

be capable to withstand a tensile load of 1000 kg without breakdown and a torsion load of

500 kg.cm without breakage as per Clause 10.14.1 of IS: 374/1979 with amendment no.1

to 6. Electrical motor should be single phase permanent capacitor type with no. of poles

12/14/16/18 (As per sweep), Class-I with basic insulation. Class of insulation shall be B

class. The winding wire used for fan should be synthetic enamelled of 30 to 38 SWG.

**Connection wire:** Flat / round Two core flexible stranded copper wire cord 24/0.2mm

ISI marked.

**Paint:** Superior quality enamel paint of specified colour for marking Sr. No and date of

rection.

### Table 2.6/1

#### Performance Parameters for Fans suitable for Rated Voltage



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

S.No.	Sweep	Maximum Input Power in watts	Air delivery in m <sup>3</sup> /minute	Minimum Service Value
			at Rated Voltage	at 180 V
1	900 mm	42	140	3.4
2	1200 mm	50	215	4.3
3	1400 mm	60	270	4.5

### Method of Construction:

Blades of ceiling fan shall be properly fixed. Down rod, clamp shall be carefully fixed

with nut bolt and split pin. Canopies shall be tightened on down rod keeping sufficient

clearance. Wiring connections shall be made with required wire leads. Regulator of

fan shall be erected on provided switchboard with required wire leads.

### Testing:

After erection fan shall be tested by connecting to supply at all positions of regulator.

Also steadiness of fan shall be checked at full speed, so that there is no wobbling.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## B) Exhaust Fans

### Scope:

### Specification No (FG-FN/EXF)

Supplying and erecting Exhaust fan of specified sweep and speed, with all accessories and necessary materials, suitable to work on 230 V / 415 V, AC Supply

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

50 Hz, erected in position.

### **Material:**

#### **Exhaust Fan:**

ISI marked Exhaust fan suitable for Single/Three phase AC 230/415 Volts 50 Hz, capacitor

run with mounting ring, four numbers of fixing hole without regulator and louvers. The

weep and speed shall be as per table below. Fan motor with moisture proof treatment and

E class insulation, ISI marked, conforming to IS: 2312/67 with amendments 1 to 8. The fan

mounting rings shall be proper pre-treatment followed with at least two coats of primer; final

finish shall be with two coats of grey colour paint duly baked. The connecting leads shall

be brought out for making connections.

**Paint:** Superior quality enamel paint of specified colour.

**Table 2.6/2**

#### **Corresponding Speed with Sweep**

S.No.	Sweep	Speed in RPM	Voltage level	CFM in m <sup>3</sup> /hr
1	375 mm	900	230 V	2460
2	375 mm	1400	230 V	4000
3	450 mm	1400	230 V	6800
4	450 mm	900	230 V	4350
5	375 mm	900	415 V	2460

### **Method of Construction:**

The Exhaust fan complete with all above accessories and duly wired shall be erected at

specified position, connected to the supply and tested.

**Testing:**

After erection fan shall be tested by connecting to supply. Also steadiness and vibrations

if any, of fan shall be checked at full speed, so that there is no wobbling.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e

each)

**2.7 Accessories for Fans (FG-FAS)**

**Metal Sheet Cawl (MSC)**

**A) Metal Sheet Cawl**

**Scope:**

**Specification No (FG-FAS/MSC)**

Supplying & erecting metal sheet cawl made from GI sheet of specified shape and with

radius more than the size of exhaust fan. The cawl mounted on angle iron frame to be fixed

to wall with grouting nut & bolts, duly painted.

**Material:**

**GI Sheet:** 20/22 SWG

**Angle iron:** 25x5x3 mm, 40x40x4 mm

**MS Flat:** 25 x 3 mm

**Metal mesh:** Expanded metal mesh

**GI Wire:** 8 SWG

**Paint:** Red Oxide, Superior quality enamel paint

**Grouting bolts:** 6 x 100 mm, 10 x 100 mm MS nut, bolts.

**Finishing material:** Cement, Sand, Putty, and Water.

**Method of Construction:**

**Sector shaped Cawl:**

Fabrication of Cawl shall be made from 22 SWG GI Sheet. The cawl shall be of round with

sector shape, having radius more than the radius of exhaust fan. Cawl shall be fixed to the

angle iron frame made from 40x40x4 mm angle, duly welded and the edges made smooth

by removing burrs, etc. At the open end expanded metal mesh shall be fixed with 25x3 mm

MS flat. Spray painting shall be done by applying 1 coat of red oxide and 2 coats of

superior quality enamel paint of colour directed by site engineer. Cawl than shall be fixed

on wall by grouting the foundation bolts. The damaged portion of wall shall be finished

properly with cement mortar, with necessary colour washing. ([Refer drawing no FG-FAS-3](#)

[\(Fig. 5\) for fabrication details.](#))

**Rectangular/Round shaped Cawl:**

Fabrication of Cawl shall be made from 20 SWG GI Sheet with slanting flaps at 45 degree.

The cawl shall be of rectangular/round shape, having 10 cms radius more than the radius

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

of exhaust fan. Cawl shall be fixed to the angle iron frame made from 25x25x3 mm angle,

duly welded and the edges made smooth by removing burrs, etc. At the fan end expanded

metal mesh shall be fixed. The flaps shall be rigidly fixed by GI wire of 8 SWG on the width

wise. Spray painting shall be done by applying 1 coat of red oxide and 2 coats of superior

quality enamel paint of colour directed by site engineer. Cawl than shall be fixed on wall by

grouting the foundation bolts. The damaged portion of wall shall be finished properly with

cement mortar, with necessary colour washing. (Refer drawing no FG-FAS-3 (Fig. 6 &

Fig.7) for fabrication details.)

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

### **DRAWINGS**

Fan clamp for round pipe with hook ( Refer drawing no. FG-FAS-1 (Fig.1)

Fan clamp for I-beam with hook ( Refer drawing no. FG-FAS-1 (Fig.2)

Fan box with hook ( Refer drawing no. FG-FAS-2 (Fig.3)

Fan hook grouted in RCC slab ( Refer drawing no. FG-FAS-2 (Fig.4)

### **SWITCHGEARS**

#### **5.1 LT --I/C M/C Switches,**

#### **ATS, Bus Bar, Feeder**

#### **Pillar SW-SWR**

#### **5.2 I/C M/C Distribution boards SW-DB**

#### **5.3 LT -- MCB SW-MCB**

**5.4 LT -- MCBDB SW-MCBDB**

**5.5 LT -- MCCB SW-MCCB**

**5.6 LT -- RCCB SW-RCCB**

**5.7 LT – Oil Circuit Breakers SW-OCB**

**5.8 LT – Air Circuit Breakers SW-ACB**

**5.9 HT – SFU, LBS SW-HTS**

**5.10 HT – Breakers (VCB) SW-VCB**

**5.11 Drawings**

**Chapter 5 Switchgears (SW)**

**5.1 LT–I/C M/C Switches, ATS, Feeder Pillar (SWR)**

**General**

All material shall confirm to relevant standard as per BIS and shall carry ISI mark.

Work shall be carried out as per the method of construction as specified by BIS/Chapter 16 of P.W. Dept. Handbook/NEC.

Refer IS; 13947/1993, For Switch gears, IS: 13703/1993 for HRC fuses.

Incoming contacts for all switchgears shall be shrouded for avoiding accidental contact.

**A) Indicator DP (BDP)**

**Scope:**

**Specification No (SW-SWR/BDP)**

Supplying surface/flush mounting Bakelite D.P switch and erecting on filled polypropylene ISI marked board or on screwed board with top of plywood pasted with

laminated.

**Material:**

**DP Switch:** Bakelite double pole switch 32A 250V, with copper contacts for make &

break, and fuse, indicator lamp with shrouded incoming contacts.

**Boards:** As per **(WG-PW/SW)** in chapter of Wiring para No. 1.6

**Hardware:** SM screws, rawl plug, wooden gutties etc.

**Method of Construction:**

The DP switch shall be erected on specified board or flush in provided enclosure.

**Mode of Measurement:**

Executed quantity will be counted on number basis. (i.e. Each)

**B) IC/Metal clad DP (MDP)**

**Scope:**

**Specification No (SW-SWR/MDP)**

Supplying and erecting IC/Metal clad DP switches of specified rating on angle iron

frame of suitable size.

**Material:**

**DP Switch:** Single phase Double pole metal / iron clad weatherproof air break switch

fuse unit, confirming to IS: 13947 (part- 1 &3)/ 1993 with facility to de-link neutral,

suitable for single phase 240 volts, 50 Hz AC supply, having positive make break arrangement with shrouded incoming contacts, cable entry holes, sealing arrangement and mounting arrangements.

**Fabrication:** Required size of angle iron / MS Flat.

**Paint:** Superior quality enamel paint of specified shade & colour, Red Oxide paint.

**Hardware:** SM screws, MS Nuts & bolts, rawl plug, wooden gutties etc.

**Grouting Material:** Cement, Sand, Putty, water, etc.

**Method of Construction:**

The switch shall be erected at designated place duly mounted on suitable size of angle iron

frame as per Table no. 5.1/1 with the help of required nut bolt washer etc. The angle frame

to be erected on wall with the help of screws, or to be grouted in wall with the help of

cement concrete etc. Frame shall be painted prior to erection.

**Mode of Measurement:**

Executed quantity will be counted on number basis. (i.e. Each)

**C) IC/Metal clad TP/TPN switches (MTP)**

**Scope:**

**Specification No (SW-SWR/MTP)**

Supplying and erecting IC/Metal clad TP/TPN /on load/off load changeover switches of

specified rating on angle iron frame of suitable size.

**Material:**

**TP/TPN Switches:** Three phase Triple pole / Three phase Triple pole with neutral link

weatherproof metal clad air break switch fuse unit of specified rating, confirming to IS:

13947 (part- 1 &3)/ 1993 with positive make and break arrangement with shrouded

incoming contacts, facility suitable for Three phase 415 volts, 50 Hz AC supply, It

shall be fitted with interlock-able cover and re-wire able type porcelain fuse and having

cable entry holes, sealing arrangement and mounting arrangements.

**Fabrication:** Required size of angle iron / MS Flat.



**Paint:** Superior quality enamel paint of specified shade & colour, Red Oxide paint.

**Hardware:** SM screws, MS Nuts & bolts, rawl plug, wooden gutties etc.

**Grouting Material:** Cement, Sand, Putty, water, etc.

**Method of Construction:**

The switch shall be erected at designated place duly mounted on suitable size of angle iron

frame as per Table No. 5.1/1 with the help of required nut bolt, washer, etc; on frame/wall.

The angle frame to be erected on wall with the help of screws, or to be grouted in wall with the

help of cement plaster, and finished as original. The Frame shall be painted prior to erection.

**Mode of Measurement:**

Executed quantity will be counted on number basis. (i.e. Each)

**D) Metal clad TP/TPN Switches with HRC fuse (TPHRC)**

**Scope**

**Specification No.: (SW-SWR/TPHRC)**

Supplying and erecting Metal clad TP/TPN switches with HRC Fuses of specified rating on angle iron frame of suitable size.

**Material:**

**TP/TPN Switches:** Combination fuse switch unit, Metal clad, Triple pole with Neutral

link, Degree of Protection IP-2L3 as per IS: 13947 (pt.3) 1993.Quick make and break,

Inter-lockable cover, uninterrupted duty, Utilization category AC-23A and confirming to

IS: 13947 (Part.3) 1993. It shall be suitable for three high rupturing capacity equal to 80 KA

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(HRC) cartridge fuses confirming to IS: 13703 (Part.1) 1993 and IS: 13703 (Part.2/Section

& 2) 1993 having rupturing capacity 80 KA minimum, with rated voltage 415 Volts, 50 Hz.

AC with shrouded incoming contacts.

**Enclosure:** Made of CRCA sheet of thickness not less than 1.2mm.

**Fuses:** 80 kA High rupturing capacity fuses with ISI mark.

**Mounting:** Required size of angle iron / MS Flat.

**Paint:** Superior quality enamel paint of specified shade & colour, Red Oxide paint.

**Hardware:** SM screws, MS Nuts & bolts, rawl plug, wooden gutties etc.

**Grouting material:** Cement, Sand, Putty, Water, etc.

### Method of Construction

The switch shall be erected at designated place duly mounted on suitable size of angle iron

frame as per table no. 5.1/1 with the help of required nut bolt, washer, etc on frame/wall.

The angle frame to be erected on wall with the help of screws, or to be grouted in wall with the

help of cement plaster, and finished as original. The Frame shall be painted prior to erection.

**Mode of Measurement:** Executed quantity will be counted on number basis. (i.e.

each)

### Table No.5.1/1

#### Minimum size of angle to be used for Mounting frames of Switchgear

S No.	Capacity	Minimum Size of angle iron
1	16A,32 A, DP/TP/TPN/ changeover switch	25x25x3 mm
2	63A to 200 A DP/TP/TPN/ changeover switch	40x40x5 mm
3	300 A and above TPN/changeover switch	50x50x6 mm

### E) Mini Feeder Pillar (MFP)

**Scope:**

**Specification No (SW-SWR/MFP)**

Fabrication of feeder pillar with CRCA sheet, fixing of aluminium strips/bars, with necessary painting and complete erection on provided cement concrete foundation.

**Material:**

**Incoming Isolator:** 200 A Four Pole MCCB with 35 kA SC rating

**CRCA Sheet: 14 gauge**

**Fabrication:** Angle iron of required size.

**Bus bar strip:** Aluminium strips with colour coding heat shrinkable sleeves

**Insulators:** Bus bar insulators (Porcelain/Epoxy)

**Gasket:** Rubber / Neoprene gasket

**Red Oxide:** Red oxide paint /Primer

**Paint:** Superior quality Enamel paint

**Hardware:** MS nut bolts of required size and length. MS Hinges, Self locks for door.

**Danger Board:** Danger notice in Marathi & English

Foundation material: Cement, Sand, water.

**Method of Construction**

The mini feeder pillar shall be fabricated from 14 SWG CRCA sheet. The size of the

chamber shall be 75 cm in height, 50 cm in width and 35 cm in depth. The top cover

(50 cm in width and 30 cm in depth) shall be fabricated in such a manner so as to

have slope on all four sides. The slope shall start at the centre of the chamber. Front

door of the feeder pillar shall have self locking arrangement (minimum two) and shall

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be fixed as directed by the site engineer. The door shall be made water proof by fixing the

rubber / neoprene gasket on the inner side. Necessary provision for ventilation shall be

made on both side of feeder pillar chamber. These shall be complete with welded non

ferrous metallic mesh so as to make it vermin proof. The entire fabricated chamber shall be

fixed frame made from 50x50x5 mm angle iron. Dimensions of the frame shall be as per

the size of the frame and the depth of the legs shall be 50 cm. The extended portion of the

leg of frame shall be covered on all four sides with 14 SWG CRCA sheet duly fixed

with suitable size of MS bolts & nuts. The chamber shall have removable bottom plate at

the end of the frame, with holes of suitable diameter for incoming and outgoing cables.

Four numbers of aluminium bars of 40 x 5 mm cross section with 35 cm in length for

three phases & neutral duly covered with colour coded PVC heat shrunk sleeves or

covered with PVC insulation tapes with colour coding, shall be fixed inside the chamber

on porcelain / epoxy insulators in staggered manner so as to facilitate the

connections of cable leads. (Minimum two insulators shall be provided), with main

cable socket to each bar. The provided Four Pole MCCB of 500 V 200 A rating, shall

be fixed on mounting made from CRCA sheet at the bottom for terminating the incoming

cable.

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The feeder pillar chamber door shall be fixed with enamel iron G.I. Sheet 18 gauge

caution board of size 200 mm x150 mm or have sticker pasted, as per I.S.2551 of

1982.

The entire feeder pillar thus fabricated shall be erected in cement concrete foundation

(with excavation of soil) with 4 numbers of suitable size foundation bolts. The minimum

dimensions of the cement concrete foundation shall be 60 cm in width, 50 cm in depth and

30 cm height.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**S No. Capacity Minimum Size of angle**

**iron**

### **5.2 I/C M/C Distribution boards (MDB)**

#### **Metal clad DB (MDB)**

**Scope:**

#### **Specification No (SW-SWR/MDB)**

Supplying, erecting Metal clad distribution board of specified ways and rating, suitable

250 V/440 V 50 Hz, AC supply, erected on iron frame/board.

**Material:**

**Distribution board:** Fabricated from 18 gauge C.R.C.A. sheet steel of required ways,

250/440 V having kitkat pattern H.C. type fuse bridges 16 A/32 A and Neutral bar connector

with earth terminal.

**Mounting:** Required size of angle iron / MS Flat.

**Paint:** Superior quality enamel paint of specified shade & colour, Red Oxide paint.

**Hardware:** SM screws, MS Nuts & bolts, rawl plug, wooden gutties etc.

**Boards:** As per **(WG-PW/SW)** in chapter of Wiring Para. No. 1.6

**Method of Construction:**

The switch shall be erected at designated place duly mounted on suitable size of angle iron

frame as per Table no. 5.2/3 with the help of required nut bolt, washer, etc on frame/wall.

The angle frame to be erected on wall with the help of screws, or to be grouted in wall with the

help of cement plaster, and finished as original. The Frame shall be painted prior to erection.

**Mode of Measurement:** Executed quantity will be counted on number basis. (i.e.

each)

**Table No. 5.2/3**

**Minimum size of angle to be used for fabrication of frames for DB's**

Sr. No	Rating of Distribution Boxes	Minimum size of angle iron in mm
1	DB 16 A, 250 V.	25x25x3
2	DB 16 A, 415 V	40x40x3
3	DB 32 A, 415 V	40x40x5

**5.3 Miniature Circuit Breakers (MCB) (MCB)**

**SP/SPN/DP/TP/FP MCB'S**

**Scope:**

**Specification No (SW-SWR/MCB)**

Supplying MCB of specified poles, current rating, and either of B or C series with required

wiring connections & lugs etc. and erecting in provided enclosure / distribution board.

### **General Specifications for MCB's**

- MCB's shall be of current limiting type, ISI marked confirms to IS 8828 – 1996.
- The power loss per pole shall be low and shall be in accordance with IS 8828 – 1996.
- All cable entries shall be either from bottom or top.
- MCB's shall be of C- curve characteristic & shall have quick make & break non-welding self wiping silver alloy contacts for 10 kA short circuit both on the manual & automatic operation.
- All the active, live parts of MCB's should be out of human reach, ensuring safety & confirms to IP: 55 degree of protection.
- The MCB's must house transparent label holder to ensure circuit identification.
- The MCB's must have fully insulated safety shutters.

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- The MCB's shall have lockable switching lever.
- The Minimum electrical endurance shall be 20,000 operations.
- The housing of the MCB shall be mounted self-extinguishing DMC (Dough Moulding Compound).
- The short circuit Current shall be brought to zero within 4 to 5 milliseconds from the time they are established.
- All MCB's shall have a minimum short circuit Capacity of 10kA RMS.

### **Material:**

***Single Pole / Single pole with Neutral / Double Pole / Triple pole / Four pole:***

MCB, ISI marked as per IS 8828 : 1996 (IEC 60898) with hammer trip and watch

mechanism 15 arc plates, 10 KA capacity with nominal rating of 240/415V.

**Lugs:** Copper lugs of suitable size as per **(CB-CL/CU)** in chapter 7.10 for Cable

**Method of Construction:**

MCB shall be erected in provided enclosure / distribution board and terminating the

provided wires by copper lugs (crimping type) and connecting the same.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**5.4 Distribution Board suitable for MCB's (MCBDB)**

**Horizontal / Vertical type DB's**

**Scope:**

**Specification No (SW-SWR/MCBDB)**

Supplying of MCBDB suitable for 230 V / 415 V, horizontal/vertical, with/without door of

specified ways (poles), surface / flush mounting to house incoming and outgoing MCB's, and

erected on iron frame.

**General Specifications for MCBDB's**

- DB's shall be prewired and shall be fabricated as per IS: 8623.
- Suitable for flush mounting & surface mounting, with 100 A copper bus bar (For Horizontal type DB), neutral bar, earth bar & cable ties for cable management.
- In case of Vertical DB the bus bar shall be of 200 A rating.
- DB's shall be of IP – 43 degree of protection.
- All the MCB distribution boards shall be fabricated out of 18 SWG thick sheet steel duly rust inhibited through a process of degreasing, pickling, phosphating & powder coating to an approved colour over primer & shall be of the totally enclosed dust proof type suitable for wall mounting.



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- All components shall be mounted on DIN rails & covered totally with a sheet steel cover rendering it finger-safe. Access to the internal connections shall be only through removing the cover sheet.
- All DB's shall be internally prewired using copper insulated high temperature PVC wires.
- Bus bars & neutral bar shall be fully insulated with standard colour code.
- Bus bar withstanding capacity shall be 10kA.
- DB's must have facility of reversing door without modification, pan assembly for ease of installation & convertible locking.

### **Material:**

**Horizontal/Vertical type MCBDB:** ISI marked as per IS 8623, of specified ways

(poles), surface/flush mounting, with/without door, suitable for 230 V / 415 V.

**Lugs** – Copper lugs of suitable size as per **(CB-CL/CU)** in chapter 7.10 for Cable

**Iron work:** Suitable size of angle/flat.

**Hardware:** SM screws, rawl plug, gutties, etc.

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### **Method of Construction:**

MCBDB shall be erected at designated location and directed by site engineer and terminating the provided wires by copper lugs (crimping type) and connecting the same.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e. each)

## **5.5 Moulded Case Circuit Breaker (MCCB) (MCCB)**

### **Scope:**

**Specification No (SW-SWR/MCCB)**

Providing & erecting 3 Pole/4 Pole MCCB of specified rating and with specified short

circuit rupturing capacity in KA, complete erecting in provided enclosure & connected

with provided leads on incoming and out going side, complete.

**General Specifications for MCCB's**

- MCCB's should comply with IS 13947 part -2, IEC (6094) and IEC 60947-3 & IEC 60947 part – 2.
- The MCCB shall be suitable for universal mounting i.e. the load/line shall be interchangeable with shrouded incoming contacts.
- The MCCB shall be suitable for minimum operating voltage of 415V.
- The thermal setting shall be adjustable from 64 % to 100% of its normal current.
- The magnetic setting shall be adjustable from 3.5 to 10 In (normal current).
- Trip reset should be available Manual / Automatic.
- Isolator switches for electronic circuits to open the MCCB automatically.
- The MCCB's must house transparent label holder to ensure circuit identification.
- The MCCB's must have fully insulated safety shutters.
- Overload Zone adjustable from 0.4 to 1 in with line (For 630 amp & above MCCB)
- Short circuit Zone adjustable from 1.5 to 10 In with time.

**Material:**

3 pole or 4 Pole MCCB Moulded case circuit breaker. Fixed version– front Terminals

with current rating & breaking capacity as below:

- i. 63 A to 125 A - 15 KA
- ii. 160 A to 250 A - 35 KA

iii. 300/400 A - 35 KA

iv. 630 A - 70 KA

**Method of Construction:**

3 pole /4 pole MCCB shall be erected in provided enclosure & connected with provided

leads/strip on incoming & out going site complete

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **5.6 Residual Current Circuit Breaker (RCCB)**

### **A) Residual Current Circuit Breaker (RCCB)**

**Scope:**

**Specification No (SW-RCCB/RCCB)**

Supplying, erecting, and commissioning of 2/4 Pole RCCB of specified rating, conforming to IS: 12640, duly connected with copper leads, copper lugs, etc., in provided enclosure.

**General Specifications for RCCB**

- RCCBs shall be ISI marked as per IS 12640 (part 1) – 2000 and Confirming to IEC 61008-1.
- It shall work on residual current energy, having 30 milliamp sensitivity and shall protect against earth leakage.
- Tripping time shall be maximum 30 milliseconds.
- Breaking capacity shall be 20 kA.
- RCCB shall operate for rated leakage at nominal Ten volts AC, and also in

both, Neutral Open & Snapping condition.

- RCCBs shall have trip free mechanism with quick make & break non-welding self wiping silver alloy contacts for 20 KA short circuit current both on the manual & automatic operation. Test knob facility shall be provided.
- All the active, live parts of RCCBs should be out of human reach, ensuring safety & confirms to IP20 degree of protection.
- The RCCBs must house transparent label holder to ensure circuit identification.
- The RCCBs must have fully insulated safety shutters.
- The Minimum electrical endurance shall be 20,000 operations.

**Material:**

**2 Pole / 4 pole**, RCCB, ISI marked as per IS: 12640-2000 (IEC 61008-1) with hammer

trip and watch mechanism 15 arc plates, 20 KA breaking capacity of specified rating suitable

for 240/415V.

**Lugs** – Copper lugs of suitable size as per **(CB-CL/CU)** in chapter 7.10 for Cable

**PVC Copper leads:** As per **WG-MA/BW** specified in chapter of Wiring in para. no.

1.3

**Method of Construction:**

2 / 4 Pole RCCB shall be erected in provided enclosure & connected with leads, with

necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **B) Residual Current Circuit Breaker with over voltage cut Off (RCBO)**

### **Scope:**

### **Specification No (SW-RCCB/RCBO)**

Supplying, erecting, and commissioning of 2 Pole RCBO (RCCB+MCB) of specified

rating, conforming to IS: 12640 duly connected with copper leads, copper lugs, etc., in

provided enclosure.

### **General Specifications for RCBO**

- RCBO's with integral combination of RCCB+MCB, shall be ISI marked as per IS 12640 (part 1) – 2000 and Confirming to IEC 61008-1.
- It shall work on residual current energy, having 30 milliamp sensitivity with protection against earth leakage and over voltage upto 290 Volts.
- Tripping time shall be maximum 30 milliseconds.

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- Breaking capacity shall be 10 kA.
- RCCB shall operate for rated leakage at nominal Ten volts AC, and also in both, Neutral Open & Snapping condition.
- RCBO's shall have trip free mechanism with quick make & break non-welding self wiping silver alloy contacts for 10 kA short circuit both on the manual & automatic operation. Test knob facility shall be provided.
- All the active, live parts of RCBO's should be out of human reach, ensuring safety & confirms to IP20 degree of protection.
- The RCBO's must house transparent label holder to ensure circuit identification.
- The RCBO's must have fully insulated safety shutters.
- The Minimum electrical endurance shall be 20,000 operations.

### **Material:**

**2 Pole / 4 pole**, RCBO with integral combination of RCCB+MCB, ISI marked as per

IS: 12640-2000 (IEC 61008-1) with hammer trip and watch mechanism 15 arc plates,

10 kA breaking capacity of specified rating suitable for 240/415V.

**Lugs** – Copper lugs of suitable size as per **(CB-CL/CU)** in chapter 7.10 for Cable

**PVC Copper leads:** Copper leads of suitable size, as per **(WG-MA/BW)** specified in

chapter of Wiring in para. No. 1.3

**Method of Construction:**

2 /4 Pole RCBO shall be erected in provided enclosure & connected with leads, with

necessary testing.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**5.7 LT – Oil Circuit Breakers (OCB)**

**Scope:**

**Specification No (SW-SWR/OCB)**

Supply, erection of panel mounting, non-draw out type Oil Circuit Breaker of specified

rating and rupturing capacity, triple pole 440 V, 50 Hz, neural link, oil filled, totally

enclosed. (Conforming to BSS 936/1960 & IS 2516/1965)

**Material:**

**Enclosure:**

Compact, all-welded robustly constructed steel enclosure, suitable for wall

mounting/pedestal mounting with standard finish of dark admiral grey paint, making perfect

for industrial use under the most severe operating conditions. The unit should also be

suitable to mount on the switchboard directly.

***Protection:***

***Overload protection:***

Overload protection is through a triple pole series, operated upto 200 Amps and above CT

operated electromagnetic overload coils suitably time lagged with oil dash pots operated

directly on the mechanism tripping the breaker on sustained overloads. These overload

devices are instantaneous self resetting type with an inverse time-lag characteristic

protecting the circuitry faster than any other type of protection. Suitable range of calibration

is also provided for, thus ensuring more accurate fool proof overload protection.

***Under Voltage protection:***

Electro-magnetic under voltage protection by an under voltage coil fitted separately and

acts directly on the mechanism Normal coil voltage is 415 Volts 50 cycles AC, A special

arrangement shall be made to make it impossible to close the breaker as long as there is

no supply.

***Short Circuit Protection:***

Short Circuit Protection is ensured through Electromagnetic series/CT operated overload

devices.

***Contacts:***

Contacts should be substantial size cross section made of Electrolytic 99.9% purely copper

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contacts that have durable silver plating on contacts. The fixed contacts are spring finger

type, fitted with easily removable arcing, Contacts. The moving contacts for lower range are

made of flat copper bars made into specific shapes and for higher ranges are made from

copper 'V' bars. Moving arcing contacts are made of hard bronze Metal and are selfaligning

type fitted to 'V' bars. Rupturing capacity shall be 15MVA up to 400A and 25 MVA

for capacity above 400A up to 800A.

### **Oil:**

First filling of oil shall be done in the oil tank & in dashpot with specific gravity 0.96, and

dielectric strength 30kV at 2.5mm gap.

### **Termination:**

Cable end box & glands on incoming side & out going sides should be provided.

### **Method of Construction:**

The O.C.B. should be erected on provided panel board complete with first filling of oil in

oil tank & in dash pot with connecting to bus bar by means of provided insulated copper

strip of suitable rating as per the rating, complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **5.8 LT – Air Circuit Breakers (ACB)**

### **Scope:**

### **Specification No (SW-SWR/ACB)**

Supplying, erecting, and commissioning of Air Circuit breaker of specified rating,



confirming to IS 2516/IES157 manually operated non draw out type/draw out type

erected at position in provided panel board in approved manner.

**Material:**

***Air Circuit Breaker:***

Draw out type/non draw out type manually quick make quick break type front operated

mechanical indication for ON/OFF position with 50 kA short circuit rating. Trip free

mechanism with high performance characteristic based on modular construction and should

be compact.

The breaker shall have following accessories:

- ***Auxiliary Switch:*** Auxiliary switch shall consist of 2 NO & 2 NC contacts.

The total Auxiliary switch block shall have minimum six auxiliary. In case of draw out breakers two sliding contacts should be provided.

- ***Alarm Switch:*** For breaker with thermal and magnetic trip units the indication should be direct from trip unit through micro switch with necessary wiring.

- ***Shunt Release:*** Shunt trips are used for remote control. Shunt trip coil should operate through an auxiliary switch. The operating ranges should be normally 50-110

% of the rated voltage.

- ***Under voltage Release:*** Under voltage release must be energized before closing breaker. This should be provided for remote control.

- ***Over current release:*** Over current release shall consist of Current

Transformer with slides on each current carrying path of a bi-metal relay common

to all transformers. The transformer shall have a fix ratio suited to particular setting

range. Overload releases shall be thermal time lagged. Overload relay range shall be 50

% to 100 % of CT ratio. Frame shall facilitate site adjustment from 25-100% of ACB

rating to match the load requirement.

- **RA unit** - given for 0-110% operating range of SHT-ensures supply available to

shunt trip from same AC source in short circuit condition.

- **RC unit** – for up to 3secs. Time delay with U/V trip. Ideal for protection against

transient voltage dips and nuisance tripping continuously adjustable time delay range

of 40-500 ms with S/c trip ideal for selective interruption co- ordination of ACB's.

- Contacts made of electrolytic copper of 99.9 % purity, of ACB shall be totally shrouded, for eliminating access to live parts.

- Short Circuit release pick up shall be adjustable for closer protection.

- Breaker shall be compact in size, for saving space in the cubicle and as far as possible shall be lightweight for easy handling.

- Thermal over load and magnetic short circuit protection shall be provided.

#### **Method of Construction:**

The breaker should be erected on provided panel board or cubicle as the case may

be, complete with connecting to bus bar by means of provided insulated copper strip of

suitable cross section as per the rating, complete.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.each)

### **5.9 HT -- SFU's, Load Break Switch (HTS)**

#### **A) HT Switch Fuse Unit/ Load Break Switch (LBS)**

##### **Scope:**

**Specification No (SW-HTS/LBS)**

Supplying and erecting extendable/ non extendable type load break switch with fuses of

required rating and with IP 55 protection class, on provided MS channels/ trench/

foundation in an approved manner.

**Recommended Standards:**

IS 9920 (Latest Revision):- Rating, performance, testing of load break switch

IS 9921 :- Standards for temperature of electrical parts exposed to air

**Load Break Switch should normally comply with the following parameters:**

S. No	Specifications	11 KV	22 KV
1	Rated Voltage	12 KV	24 KV
2	Rated Current	630A	630A
3	Rated short time current	25 KA	25 KA
4	Rated making current	62.5 KA	62.5 KA
5	Rated breaking current	630A	630A
6	Impulse withstand voltage		
	Earth and between poles	75 KV	125 KV
	Across the isolation distance	85 KV	145 KV
7	Power frequency test voltage		
	Earth and between poles	28 KV	50KV
	Across the isolation distance	32 KV	60KV

**Material:**

- **Steel Sheet**
- **Electrolytic Aluminium Bus bar of 400A**
- **Arc Chutes**
- **Epoxy Resin Cast Type Insulators**
- **H.T. Fuses of adequate capacity**
- **Shunt Trip Coil**
- **Manual trip push button**
- **Auxiliary contacts**
- **Earth switch**

• **Earth Bus bar copper (25x3)**

**Method of Construction:**

Load break switch should be erected on provided MS channels/ trench/ foundation as per

approved drawing by site in charge.

Manufacturer's certificate for type test should be obtained.

Routine Type test should be carried out at site.

An earth switch having separate operating handle should be interlocked with main switch

should be checked.

An operating handle with correct sequence device having ON and OFF position and

arrangement for pad locking provided should be checked.

**Application:**

Load break switch is suitable mainly for underground H.T. distribution system. It can be

used for switching of transformers, overhead lines, capacitors, ring mains and cables.

**Mode of Measurement:** Executed quantity will be counted on number basis. (i.e. each)

**B) Ring Main Unit: (RMU)**

**Scope:**

**Specification No (SW-HTS/RMU)**

Supplying and erecting Indoor type ring main unit with 2 incoming and 1 outgoing with HRC

fuses and with IP 55 protection class, complete erected on provided CC foundation/ MS

channels/ trench in an approved manner. ( [Refer drawing no. SW-HTS-1](#))

**Recommended Standards:**

IS 9920 (Latest Revision):- Rating, performance, testing of Ring Main Unit

IS 9921 :- Standards for temperature of electrical parts exposed to air

**Material:**

- ***Steel Sheet***
- ***Electrolytic copper Bus bar of 400 A***
- ***Arc Chutes***
- ***Epoxy Resin Cast Type Insulators***
- ***H.T. Fuses of adequate capacity***
- ***Shunt Trip Coil***
- ***Manual trip push button***
- ***Auxiliary contacts***
- ***Earth switch***
- ***Earth Bus bar copper (25x3)***

**Method of Construction:**

Ring main unit should be erected on provided MS channels/ trench/foundation as per

approved drawing by site in charge.

Manufacturer's certificate for type test should be obtained.

Routine Type test should be carried out at site.

An earth switch having separate operating handle should be interlocked with main switch

should be checked.

An operating handle with correct sequence device having ON and OFF position and

arrangement for pad locking provided should be checked.

**Application:**

Ring Main Unit is suitable mainly for underground distribution system. It can be used for

switching of transformers, overhead lines, capacitors, ring mains and cables

Mode of Measurement: - Per RMU

**Mode of Measurement:** Executed quantity will be counted on number basis. (i.e. each)

## **CONTROL PANEL**

### **6.1 Sheets No Specs**

### **6.2 Bus-bars CP-BB/**

### **6.3 Measuring Instruments No Specs**

### **6.4 Accessories No Specs**

## **Chapter 6 Control Panel (CP)**

### **6.2 Bus bar (BB)**

#### **Scope:**

#### **Specification No (CP-BB)**

Fabrication of bus bar chamber, fixing of bus bar of specified metal, complete erection

of the bus bar chamber on provided angle iron or as instructed.

#### **Material:**

**Sheet: 16 gauge CRCA sheet**

**Fabrication material:** Angle iron of required size, Hinges made from MS.

**Bus bar strip:** Aluminum/Copper strips covered with colour coded PVC heat shrunk

sleeves or wrapped with PVC insulation tape with colour coding.

**Bus bar support:** Bus bar insulators (Porcelain/Epoxy)

**Earth stud:** MS Nut & Bolt minimum 10 mm diameter.

**Packing material:** Rubber / Neoprene gasket

**Paint:** Red oxide paint /Primer, Enamel paint

**Hardware:** Nuts, bolts, washers, etc of required size & length.

**Danger Board:** GI Sheet danger board in Marathi & English or Screen printed sticker.

**Method of Construction:**

The bus bar chamber shall be fabricated from 16 SWG CRCA sheet with necessary clearance on all side as mentioned in Table No 5/1 duly painted with one coat of

red oxide/primer and with 2 coats of Superior quality enamel paint of required shade. The

earth stud shall be welded to the chamber. The bus bar shall be fixed on fabricated bracket

(to be fixed on inner rear surface of the box), with minimum three porcelain / epoxy bus bar

insulator minimum at both ends & at the centre of the bar (with distance of

45cms.between insulators), with minimum 40x8 mm MS nut bolt, spring washers, etc. The

above method shall be adopted for all the 4 bars. The bar shall be vertically fixed in

staggered manner so as to maintain clearance in between the bars as per Table No. 6.2/2.

All the bars shall either be covered with colour coded PVC heat shrunk sleeves or wrapped

with PVC insulation tape with colour coding. (i.e. R, Y, B, N). The chamber shall be fixed on

25x25x4 mm angle iron frame to make it sturdy. The chamber shall have minimum one

hole per bus bar for fixing incoming cable, and required holes for the out going cables. The

size of the bar either aluminium / copper for the required rating shall be as per Table No

6.2/1

**Mode of Measurement:**

Measurement will be on running metre basis of the length of the bus bar provided in the

chamber. (i.e. per meter length of bus bar)

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**Table No 6.2/1**

**Dimensions of Bus bar chamber & Size & Number of Strips required for the corresponding**

S.No	Dimensions of Bus bar chamber Length, Height, Depth in mm	Aluminum/ Copper bus bar length per phase in mm	Current rating in amperes	No. of Insulators (Epoxy /Porcelain) per bus	Recommended rectangular cross section			
					Aluminium		Copper	
					No. of strips per phase	Size in mm	No. of strip per phase	Size in mm
1	1150x400x150	1000	100	3	1	25x5	1	20x5
2	1150x400x150	1000	200	3	1	40x5	1	30x5
3	1150x400x150	1000	300	3	1	50x5	1	40x5
4	1150x500x300	1000	400	3	1	50x10	1	50x5
5	1150x500x300	1000	630	3	2	40x10	-	-
6	1150x500x300	1000	800	3	2	50x10	-	-

**Table No 6.2/2**

**Minimum Clearance between Bus Bars in Bus Bar Chamber / Control Panel**

**(IS: 4237-1967)**

S.No.	Voltage level (kV)	Clearance in mm	
		Between Phases	Between Phase & Earth
1.	0.416	19	16
2.	0.6	25	19
3.	3.3	51	35
4.	11	127	77
5.	22	242	140
6.	33	356	223

**CABLES**



**7.1 LT Cables (Aluminium) CB-LT/AL/**

**7.2 LT Cables (Copper) CB-LT/CU**

**7.3 HT Cables CB-HT/**

**7.4 Cable Joints, Termination**

**Kit (LT) CB-JT/LT**

**7.5 Cable Joints, Termination**

**Kit (HT) CB-JT/HT**

**7.6 Cable Enclosure (Pipes) CB-CE/**

**7.7 Cable Glands CB-GL/**

**7.8 Street Light Boxes &**

**Cable Indicators CB-SB/ CB-CIP**

**7.9 Cable Lugs (Copper) CB-CL/CU**

**7.10 Cable Lugs (Aluminium) CB-CL/AL**

**7.11 Drawings**

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**Chapter 7 PVC/XLPE Cables (CB)**

**7.1, 7.2, & 7.3 Armoured Cables (HT & LT)**

**1. General**

All material shall conform to relevant standard as per BIS and shall carry ISI mark. If

any particular category of material for which ISI mark is not available in market, it shall be

as included in approved list.

Work shall be carried out as per the method of construction specified by BIS. If there is

no reference for particular method of construction in IS, such work shall be carried out as per

the approved method of construction specified in chapter 16 of P.W. Dept. Handbook.

Material and Work not qualifying to any provision mentioned above shall be to the

satisfaction of the Engineer in Charge.

## **2. Cables: (Armoured)**

The following list records those Indian Standards in force, which are acceptable as

good practice, and accepted standards.

SP 30: 1984 : National Electrical Code

SP 7 (Group 4): 2005 : National Building Code

IS 1255: 1983 Code of practice of Installation & Maintenance of armoured cables up to 33 kV.

IS 3961: Part 2: 1967 : Recommended current ratings of PVC cables.

IS 1554: Part 1; 1988 : PVC Insulated (Heavy duty) Electric Cables; Part 1 for working voltages up to and including 1100 Volts.

IS 1554: Part 2; 1988 : PVC Insulated (Heavy duty) Electric Cables; Part 1 for working voltages up to and including 3.3 kV to 11 kV.

IS 10810: Part 63; 1993 : Method for Test of cables, Part 63 Smoke density of electric cables under fire condition.

## **3. Scope: (Armoured cables)**

### **Specification No. (CB-LT/AL, CB-LT/CU, CB-HT)**

Providing armoured cable of specified voltage level, size & specified conducting material

(Aluminum / Copper) as per **Table no. 7/3** including required material, hardware's for

erection and erecting on wall, ceiling, RCC slab or drawing the same through pole, pipe, laying

in provided conduit, trench, ducts, trays as per approved method of construction including

glands, lugs, etc.

#### **4. Material:**

##### **Cables:**

Cables shall be PVC for LT/MP and XLPE for HT as per Table no. 7/3 and of required

construction, colour, shall carry ISI mark, IS No, manufacturer's name, size, duly embossed

/ screen printed at every metre and having the total count of progressive length in meter at

each mark.

**Earth wire:** Galvanized Iron (G I) wire of appropriate gauge as per Table No 7/1.

**Glands:** As per specification **(CB-GL)**

**Lugs:** As per specification **(CB-CL/AL, CB-CL/CU)**

**Saddles:** Saddles fabricated from GI sheet of required gauge and size depending on dia of

cable either galvanized or painted with superior quality enamel black paint with necessary

shearing mechanical strength, semi circular shaped with extended piece having suitable

holes for fixing.

**G I Strip:** 22 g x 25 mm width G I Strip.

**Clamps:** MS Clamps fabricated of required length and shape, having the size of 3/6 mm

thick mild steel having 25/50 mm width (as per size of cable), rounded ends with wooden /

resin cast grip for holding the cable.

**Identification tags:** For identifying root, connection position GI strip with identification mark

/ name embossed / painted with arrangement to tie should be fix on cable or arrangement

of ferrules to be done.

**Hardware:** Sheet Metal (SM) screws of required sizes, plugs / wooden gutties, etc.

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#### **4. Method of Construction:**

##### **General:**

a) Irrespective of method of construction the cable ends shall be terminated with appropriate

size & type of glands with lugs duly crimped, as directed by Site engineer.

b) Wherever the cable has to be bent, the turning radius shall be as mentioned in Table No

7/2. Grouping of cables shall be done with adequate distance between cables as mentioned in IS so as to minimize de-rating. Cables shall be tagged/ferruled with

identification name / mark at the point from where distribution starts and at ends. Bare earth

wire of appropriate size as per Table no. 7/1 shall run along with the cable. Earth wire

running with the cable shall be terminated at the earth terminal nearest to cable termination.

##### **5.1 Erection of Cable on Surface:**

Erection shall be done as per the routes and layout finalized, in perfect level and in plumb.

Before fixing the cable shall be straightened as far as possible for good aesthetics look,

continuous bare GI earth wire of required gauge as per Table No 7/1 shall be run. Cable

with G I wire shall be fixed by saddles firmly clipped on cable and shall be fixed to wall with

minimum 50 x 8 mm SM screws with plugs/wooden gutties, etc. (Distance between two

supports / saddles shall be maximum 450 mm). Wooden gutties shall be used wherever

required (Especially for stone wall). The entries made in wall, floor slab, etc for laying the

cable shall be made good by filling and finishing with plastering the same.

### **5.2 Erection of Cable on Trusses:**

Cable along with bare GI earth wire, while erecting on trusses, shall be firmly clamped by

wrapping GI strip of 22 g, 25 mm width of required length fixed to truss with nuts and bolts.

### **5.3 Erection of Cable on Pole:**

Cable along with bare GI earth wire, while erecting on pole, shall be firmly clipped by

suitable wooden / epoxy resin cast grips, clamped with 25 x 3 mm or 50x6 mm MS strip of

required length and fixed to pole with nuts and bolts.

### **5.4 Laying of Cable in provided Trench/Pole:**

While laying Cable along with bare GI earth wire, utmost care shall be taken to prevent

damage to the insulation of the cable and to the open end. Cable shall be brought out from

trench vertically straight (minimum 1.0 metre above G L). Care shall be taken to inspect the

trench so that depth of cable shall not be less than as shown in Table No 7/4. Suitable size

of cable loops shall be provided near termination point at adequate depth.

### **5.5 Erecting cable in constructed Trench / duct:**

Erection of cable/s in constructed trench / duct, shall be as per guide lines of IS 1255.

### **5.6 Erection of cable/s on trays:**

Cable/s shall be tied with PVC tags on GI trays. At bending point care shall be taken so

that sharp edges of sheet will not damage insulation of cable.

**5.7 Mode of Measurement:** Executed quantity shall be measured on the basis of running

metre per run of cable.

## 6. Dismantling

Cable laid underground, or fixed on any surface shall be dismantled carefully without

damaging complete with all its accessories, making coil and stored as directed. The surface

of the dismantled cable shall be made clear by removing of unwanted material, cement

mortar, etc. When cable is dismantled from trench refill back the trench and making the

surface proper.

**7. Mode of Measurement:** Executed quantity shall be measured on the basis of running

metre per run of cable.

**Table No 7/1**

S.No.	Size of cable	Size of bare GI Earth wire to be used with cable
1	2.5 Sqmm to 50 Sqmm of all cores.	12 SWG
2	70 Sqmm to 95 Sqmm of all cores.	10 SWG
3	120 Sqmm and above of all cores.	8 SWG

**Table No 7/2**

## Minimum bending Radius for Cables

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

S.No.	Voltage level of cables	Single core	Multi core Unarmoured	Multi core Armoured
1	Up to 11 kV	20 D	15 D	12 D
2	Up to 22 kV	25 D	20 D	15 D
3	Up to 33 kV	30 D	25 D	20 D

**Note:** D diameter of cable.

**Wherever possible, 25 percent larger radii than the specified above should be used.**

**Table**

**No**

**7/3**

Nominal area of conductor	Aluminum Conductor				Copper Conductor			
	Single Core		Multi Core		Single Core		Multi Core	
Sqmm	PVC	XLPE	PVC	XLPE	PVC	XLPE	PVC	XLPE
10	51	55	46	50	65	71	60	65
16	66	74	60	68	85	95	77	87
25	86	98	76	90	110	125	99	115
35	100	118	92	108	130	150	120	138
50	120	137	110	126	155	175	145	161
70	140	172	135	158	190	220	175	202
95	175	204	165	187	220	260	210	239
120	195	234	185	215	250	301	240	276
150	220	262	210	240	280	336	270	308
185	240	298	235	273	305	381	300	350
240	270	344	275	316	345	441	345	405
300	295	387	305	355	375	496	385	455
400	325	458	335	420	400	586	425	538
500	345	495	-	-	425	635	-	-
630	390	555	-	-	470	710	-	-
800	440	625	-	-	-	-	-	-
1000	490	685	-	-	-	-	-	-

Rating Factors for Variation in Ambient Air Temperature			
Air Temperature (°C)	40	45	50
Rating Factor (XLPE)	1.00	0.94	0.88
Rating Factor (PVC)	1.00	0.90	0.81

**Table No 7/4**

**Minimum laying Depth of cables (IS: 1255)**

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

S.No.	Voltage level of cables	Minimum depth from top of the cable
1	Up to 1.1 kV	750 mm
2	3.3 kV to 11 kV	900 mm
3	22 kV to 33 kV	1050 mm
4	At road crossing	1000 mm
5	At railway crossing (from Bottom of sleepers to Top of pipe)	1000 mm

**Notes below Table No 7/4:**

1.	PVC Insulated electrical cable for voltage grade up to 1.1 kV is based on 8 volts drop.			
2.	The distances are given in meters and after rounding.			
3.	The distances are given in meters and after rounding.			
For Temperature Correction please see as detailed below:				
Ground temp.	20 degree C	25 degree C	30 degree C	35 degree C
Rating factors:	0.95	0.90	0.85	0.80

**Table No 7/5**

**Distance up to which different sizes of UG Aluminum Conductor Cables 1.1 kV grade,**

**can be used for different current ratings of 8 Volts drop. (PVC insulated, PVC Sheathed, 3 cores or 4 cores)**



## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Maximum Conductor temperature – 70 degree C														
S. No	Current	Distance in meters for the following cable sizes in Sqmm												
		6	10	16	25	35	50	70	95	120	150	185	240	300
1	5	185	280	415	725	895	1300	1925	2360	3065	3555	4300	5770	6460
2	10	80	130	205	360	450	650	960	1180	1530	1775	2150	2885	3230
3	15	55	85	140	240	300	430	640	785	1020	1185	1430	1920	2155
4	20	40	65	100	180	225	325	480	590	765	890	1075	1440	1615
5	25	30	50	80	145	180	260	385	470	610	710	860	1150	1290
6	30	25	40	70	120	150	215	320	390	570	590	715	960	1075
7	40	20	30	50	90	110	160	240	295	380	445	535	720	805
8	50	-	25	40	70	90	130	190	235	305	355	430	575	645
9	60	-	-	35	60	75	110	160	195	255	295	355	480	535
10	70	-	-	30	50	65	90	135	165	215	255	305	410	460
11	80	-	-	-	45	55	80	120	145	190	220	265	360	405
12	90	-	-	-	40	50	70	105	130	170	195	235	320	360
13	100	-	-	-	35	45	65	95	115	150	175	215	290	320
14	110	-	-	-	-	40	60	85	105	140	160	195	260	290
15	120	-	-	-	-	35	55	80	95	125	145	180	240	270
16	130	-	-	-	-	-	50	75	90	115	135	165	220	250
17	140	-	-	-	-	-	45	70	80	110	125	150	205	230
18	150	-	-	-	-	-	-	65	75	100	115	140	190	215
19	160	-	-	-	-	-	-	60	70	95	110	130	180	200
20	170	-	-	-	-	-	-	55	70	90	105	125	170	190
21	180	-	-	-	-	-	-	50	65	85	100	120	160	180
22	190	-	-	-	-	-	-	-	60	80	90	110	150	170
23	200	-	-	-	-	-	-	-	60	75	90	105	145	160
24	225	-	-	-	-	-	-	-	-	65	80	95	125	145
25	250	-	-	-	-	-	-	-	-	-	70	85	115	130
26	275	-	-	-	-	-	-	-	-	-	-	80	105	115
27	300	-	-	-	-	-	-	-	-	-	-	70	95	105

### 7.4 & 7.5 Cable Joints & End Termination Kits

#### (LT/HT Cables) (JT/LT/HT)

#### 1. Scope:

#### Specification No (CB-JT/LT/HT)

Providing straight through cable jointing kit of approved make and jointing cable as per the

manufacturer's instructions and duly marking name of jointer and date.

## **2. Material:**

**Joint kit:** Kit manufactured by reputed manufacturer with PVC moulds made in two parts,

with epoxy compound, earth continuity lead of appropriate cross section having lugs at

both ends, aluminum ferrules of the size of the cable, cross shaped epoxy spacer,

MS clips for holding the moulds, adhesive for pasting the moulds.

## **3. Method of Construction:**

### **3.1 Straight through joint Kit: LT/HT Cables**

Before providing joint to the cable, the cable ends of the equivalent length of the joint

moulds, shall be prepared by removing the outer PVC insulation along with the steel

armouring. The ferrule shall then be inserted over the bare core of the cable, and

shall be crimped with hydraulic / mechanical type heavy duty crimping tool. The

crimped portion shall be wrapped first with the PVC insulation tape and then with the

insulation tape used for wrapping HT conductor. The above method shall be carried

out for all the cores strictly following the colour code. The leads of the both the cables

now shall be placed into the mould by using the epoxy spacer, for having sufficient

gap in-between the leads. The earth continuity lead shall be clamped to the both ends of

the cable. After covering the cable leads with the PVC moulds, the edges shall be clipped after applying the adhesive on the inside face of the moulds. The pasting of

moulds shall be rigid and as far as possible leak proof, so that the epoxy compound

shall not spill out. Now the duly stirred epoxy compound shall be poured and fill till the

compound rises through the risers provided on the moulds.

After completing the above procedure, the joint shall be allowed to dry out for at least 8 to

10 hours (for epoxy compound to get hardened) depending upon the size of cable. Before

connecting to supply, the dry and hardened joint shall be tested for its insulation level with

1000 V/ 5000 V Meggar.

The cable should be fixed or laid in such manner that there should not be pressure on end

of moulds or on jointing position of cables. ([Refer drawing No. CB-JT-1](#))

### **3.2 Outdoor/Indoor end termination Kit: LT/HT Cables**

Before providing end termination kit to the cable, the cable end of the equivalent length of

the moulds, shall be prepared by removing the outer PVC insulation along with the steel

armouring. The ferrule shall then be inserted over the bare core of the cable, and shall be

crimped with hydraulic / mechanical type heavy duty crimping tool. The crimping shall be

done in such a manner that there shall be no air gap. Then the crimped portion shall be

wrapped first with the PVC insulation tape and then with the insulation tape used for

wrapping HT conductor. The above method shall be carried out for all the cores strictly

following the colour code. The leads of the cable now shall be placed into the mould by

using the epoxy spacer, for having sufficient gap in-between the leads. The earth continuity

lead shall be clamped to the ends of the cable. After covering the cable leads with the PVC

moulds, the edges shall be clipped after applying the adhesive on the inside face of the

moulds. The pasting of moulds shall be rigid and as far as possible leak proof, so that the

epoxy compound shall not spill out. Now the duly stirred epoxy compound shall be poured

and fill till the compound rises through the risers provided on the moulds. ([Refer drawing](#)

[No. CB-JT-2\)](#)

After completing the above procedure, the joint shall be allowed to dry out for at least 8 to

10 hours (for epoxy compound to get hardened) depending upon the size of cable. Before

connecting to supply, the dry and hardened joint shall be tested for its insulation level with

1000 V/ 5000 V Meggar.

#### **4 Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each).

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#### 7.7 Cable Glands (GL)

##### **Scope:**

##### **Specification Nos (CB-GL)**

Termination of cable ends with cable glands for preparing and fixing the cable leads

for connection. Cable glands shall be of Flange type.

##### **Material:**

**Cable glands:** Flange type heavy duty. Made of high purity brass metal, with brass

washers, rubber rings, threaded stud with washers and nuts.

### **Method of Construction**

Before erection of gland, the cable end shall be prepared by removing the outer PVC

insulation up to the point where gland to be fixed, by assessing the length of leads required.

Bottom portion of gland shall be inserted over the steel armouring, and then armour strips

shall be bent for the length of collar of gland, remaining length of armoring shall be cut. The

cable end shall then be, inserted through the entry of plate where the cable is to be

terminated. The top portion of gland with washer shall be then inserted in such a manner

that the bent armour strip should be touching the surface of the entry. The nuts shall be

tightened with spring washers over the projected stud portion. Fixing of gland shall be at

right angle to the gland plate. Tightening shall assure continuity of earth. Hole to the gland

plate shall be punched / knocked out, of correct diameter with respect to gland size.

### **Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each).

## **7.8 Street Light Boxes & Cable Indicators**

### **A) Cable Indicator Plate (CIP)**

#### **Scope:**

#### **Specification No (CB-CIP)**

Providing and fixing of cable indicator plate along the route of under ground cable.

**Material:**

**Cable indicator plate:** Circular plate made of cast iron having 100 mm dia. and 6

mm thick.

**Iron rod for fixing of cable indicator plate:** 700 mm long galvanized iron rod of 12

mm dia., and 150 mm long cross bar welded at bottom or hook to be made with same

continuous bar.

**Method of Construction:**

Cable indicator plate fixed/welded to the 700 mm long iron rod or angle, with 150 mm cross

bars welded at bottom as fasteners or bent in 'J' shape to hook the cable in the bent

portion, shall be buried along the route of cable in the trench made for laying the cable. For

clear visibility, the Cable indicator plate shall be buried in such a manner that the plate

should be minimum 200 mm above the ground level and shall be provided at every 15-25

metre in straight run, at both ends of road crossing and immediate before and after turning

point of cable.

**Mode of Measurement:**

Executed quantity will be measured on number basis. (I.e. each).

**B) Street Light Boxes (SB)**

**Scope:**

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**Specification No (CB-SB)**

Providing and fixing of CRCA sheet metal / FRP boxes on pole with MS Clamps fixing to

poles and terminating the cable.

**Material:**

**CRCA sheet metal box:** 16 gauge CRCA sheet with mounting arrangement for kitkat /

MCB

**Bakelite connectors:** Bakelite connector of 2/4 ways, 32A, 250 V.

**MS Clamps:** Clamps fabricated of required length and shape, of 3 mm thick mild steel

having 40 mm width.

**Hardware:** 10 mm mild steel nuts and bolts.

**Paint for CRCA box:** Superior quality aluminum / silver paint or required shade enameled

paint as per the requirement of site engineer.

**Primer / Red oxide:** Superior quality primer / red oxide for use on sheet metal.

**Method of Construction:**

**CRCA Sheet metal boxes:**

Box shall be fabricated from 16 gauge CRCA sheet as per dimensions specified in item, with minimum 3 mm fold on front side of the box so as to make it water proof

(Rubber beading / gasket shall be pasted on the edges / asbestos rope beading).

Edges of front cover shall be folded in such a manner so that it shall cover the front

opening of the box. The front cover shall be fixed either by screws or be hinged (as

per requirement), with self-locking arrangement. There shall be provision of fixing

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

connector / porcelain kitkat fuse / single pole MCB, inside the box. Provision of two

holes of minimum 10 mm dia. for fixing bolt of clamp and one hole of required dia. for

PVC wire leads, shall be made at the rear side of the box and provision for holes of

required dia. at bottom for fixing the cable gland of incoming and outgoing cables.

Box shall have earth terminal. Box shall have anti rust treatment and be painted with

two coats of red oxide and finally two coats aluminum / silver paint. Rubber gasket

shall be provided for making the box watertight. Unless and otherwise specified, the

mounting height of the box shall be minimum 1750 mm from the finished ground level

for facilitating easy maintenance.

### **FRP boxes:**

FRP boxes manufactured with minimum wall thickness of 2.7 mm either gray or blue in

colour, having provision for fixing either porcelain kitkat fuse or Single pole MCB, 4 way

bakelite connector, and with provision of two holes of minimum 10 mm dia. for fixing bolt of

clamp and one hole of required dia. for PVC wire leads, shall be made at the rear side of

the box and one hole of required dia. at bottom to for fixing the cable gland of incoming and

outgoing cables. The front cover shall be hinged, with locking arrangement and lock and

key. The mounting height of the box shall be minimum 1750 mm from the finished ground



level for facilitating easy maintenance. Wherever required fixing of box shall be done with

MS clamps of required length, so as to hold pipe pole / RSJ pole and shall be duly painted

in approved manner.

**Mode of Measurement:**

Executed quantity will be measured on number basis. (I.e. each).

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**7.9 & 7.10 Cable Lugs (Aluminum & Copper)**

**2. Scope:**

**Specification Nos (CB-CL/AL, CB-CL/CU)**

Crimping of lugs, and fixing to the terminals with nuts and bolts, etc.

**3. Material:**

**Lug:** Lug shall be of high purity aluminum / copper / bimetallic of required type, with

required size of hole and smooth finished both from inside and outside.

**Hardware:** Brass or Cadmium plated mild steel nuts and bolts, bimetallic washers.

**Anti-Oxide paste:** Paste of superior quality manufactured by reputed manufacturer.

**4. Method of Construction:**

Before fixing of lugs to the cable end, the cable end to the equivalent length of the lug shall

be prepared by removing the outer PVC insulation along with the steel armouring and then,

the inner PVC insulation. The paste shall be applied to the cable lead and inside the lug

prior to the inserting of lug on the cable lead. The lug shall then be crimped with hydraulic /

mechanical type heavy duty crimping tool. The crimping shall be done in such a manner

that there shall be no air gap. Then the crimped portion shall be wrapped with the PVC

insulation tape. (Colour of tape shall be of that of cable lead) The above method shall

be carried out for all the cores. The cable end with lug shall then be terminated into the

terminal and then be tightened with either brass nuts or Cadmium plated nuts as directed

by Engineer in-charge.

**5. Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each).

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**OVERHEAD SYSTEMS**

**8.1 Steel Poles OH-PL**

**8.2 Spun Poles OH-SPP**

**8.3 Hot dipped Galvanized**

**Poles & High Mast OH-HM**

**8.4 Brackets OH-BKT**

**8.5 Conductors OH-CON**

**8.6 Insulators OH-INS**

**8.7 Accessories No Specs**

**8.8 Drawings**

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## Chapter 8 Overhead Systems (OH)

### 8.1 Steel Poles (OH-PL)

#### A) Steel Tubular Poles (OH-PL/STP)

**Scope:**

**Specification No (OH-PL/STP)**

Supply of steel tubular swaged pole (Swan type or other wise) as per IS 2713: Part 2

1980, fabricated with earthing stud, pole base plate with required numbers of holes

as per drawing and erecting the pole, including painting in provided foundation as per

method of construction.

**Material:**

**Pole:** Steel tubular swaged pole (Swan type or other wise) as per Table No 8/1

**Base plate:** MS Base plate of 30x30x0.6 cms.

**Pole Cap:** Pole cap 4 mm thick with inside diameter equal to outside Dia. of the pole

and minimum height shall be 100 mm and welded or fixed with set screws.

**Earth Stud:** Earth stud 5/8"mm Dia. bolt welded to pole with required size nut and

double G.I. /M.S. washers

**Paint:** Red oxide paint as primer, bituminous paint, Aluminium paint/ any other paint

as per the instructions of engineer-in-charge.

**Method of construction:**

Before erection of pole base plate of size 30x30x0.6 cm shall be full length welded or

fixed with 4 set screws at the bottom of the pole, a suitable hole of required diameter

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

and at specified height shall be drilled and welded with knock out nipple for laying

wires for street light poles at required height. The pole shall be then painted by 2

coats of red oxide paint and one coat of bituminous paint before erection for min 1/6 length

which is to be buried in ground & after erection remaining portion to be painted by two

coats of aluminium paint. The pole shall be erected in provided pit with cement Concrete foundation and muffing in perfect plumb.

### Mode of Measurement:

Executed quantity will be measured on number basis. (I.e. each)

**Table 8.1/1**

### Swaged Poles Made From Steel of Ultimate as per IS: 2713 (Part-II) 1980

Designation	Overall Length in mtr	Planting Depth in mtr	Height above Ground in mtr	Length of Sections in mtr			Outside Diameter / Thickness of Sections			Approx Weight of Pole. Kg
				Bottom h3	Middle h2	Top h1	Bottom	Middle	Top	
410 SP-28	9.00	1.50	7.50	5.00	2.00	2.00	139.7 x 4.50	114.3 x 3.65	88.9 x 3.25	113
410 SP-31	9.00	1.50	7.50	5.00	2.00	2.00	165.1 x 4.50	139.7 x 4.50	114.3 x 3.65	147
410 SP-52	11.00	1.80	9.20	5.60	2.70	2.70	165.1 x 4.50	139.7 x 4.50	114.3 x 3.65	175
410 SP-60	12.00	2.00	0.60	5.80	3.10	3.10	165.1 x 5.40	139.7 x 4.50	114.3 x 3.65	208

### B) Rolled Steel Joist (RSJ) Poles (OH-PL/RSJ)

#### Scope:

#### Specification No (OH-PL/RSJ)

Supply and erection of Rolled Steel Joist (Girder) pole as per IS 2713, including painting

in provided foundation as per method of construction.

**Material:**

**Pole:** Rolled Steel Joist ( Girder) As per Table No 8.1/2

**Base plate:** MS Base plate of 30x30x0.6 cms.

**Hardware:** Nut and bolts for fixing earth wire

**Paint:** Bituminous paint, Aluminium paint, Red oxide paint.

**Method of construction:**

Before erection of pole base plate of size 30x30x0.6 cm shall be full length welded at

the bottom of pole, a suitable hole of required diameter and at specified height shall

be drilled for earth stud. The pole shall be then painted by 2 coats of red oxide paint

as primer for full length and then by one coat of bituminous paint before erection for

min.1/6 length which is to be buried in ground & after erection remaining portion to be

painted by two coats of aluminium paint. The pole shall be erected in provided pit with

cement concrete foundation and muffing in perfect plumb.

**Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each)

**Table No. 8.1/2**

**Weight of various sizes of RSJ Poles with 8.5 meter length**

RSJ POLE	Size	Weight per Meter
Rolled steel Joist	150x80 / 150x75mm	14.9 Kg/meter
Rolled steel Joist	200x100 mm	25.4 Kg/meter
Rolled steel Joist	175x90 mm	19.3 Kg/meter
Rolled steel Joist	100x116 mm	23.0 Kg/meter
Rolled steel Joist	125x75 mm	12.42 Kg/meter
Rolled steel Joist	152x152 mm	37.0 Kg/meter

**C) Rail Poles (OH-PL/RLP)**

**Scope:**

**Specification No (OH-PL/RLP)**

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Supply and erection of Rail Pole including painting in provided foundation as per method of

construction.

### **Material:**

**Pole:** Rail Pole 29.76 Kg/ metre, as per IS 2713 (Part II)

**Base plate:** MS Base plate of 30x30x0.6 cms.

**Hardware:** Nut and bolts for fixing earth wire

**Paint:** Bituminous paint, Aluminium paint, Red oxide paint.

### **Method of construction:**

Before erection of pole, base plate of size 30x30x0.6 cm shall be full length welded or

fixed with 4 set screws at the bottom of pole, a suitable hole of required diameter and at

specified height shall be drilled for earth stud. The pole shall be then painted by 2 coats of

red oxide paint as primer for full length and then by one coat of bituminous paint before

erection for 1/6 length which is to be buried in ground & after erection remaining portion is

to be painted by two coats of aluminium paint. The pole shall be erected in provided pit

with cement concrete foundation and muffing in perfect plumb.

### **Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each)

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## **D) G I Pipe Pole (OH-PL/GIP)**

### **Scope:**

### **Specification No (OH-PL/GIP)**

Supply and erection of ISI mark G.I. Pipe Pole 'B' Grade 75/80 mm dia. 6 m long

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

including painting in provided foundation as per method of construction.

### **Material:**

**Pole:** ISI mark G.I. Pipe Pole 'B' Grade 75/80mm dia. of total length 6 meter

**Base plate:** CI/MS Base plate of 30x30x0.6 cms.

**Pole Cap:** Pole cap 4 mm thick with inside diameter equal to outside Dia. of the pole

and minimum height shall be 75 mm shall be welded or fixed with set screws.

**Earth Stud:** Earth stud 5/8"mm Dia. size bolt welded to pole with required size nut

and double G.I. /M.S. washers

**Paint:** Bituminous paint, Aluminium paint/ any other paint as per the instructions of

engineer-in-charge, Red oxide paint.

### **Method of construction:**

Before erection of pole base plate of size 30x30x0.6 cm shall be full length welded or

fixed with 4 set screws at the bottom of pole, a suitable hole of required diameter and at

specified height shall be drilled and welded with knock out nipple for laying wires of

street light. The pole shall be then painted by 2 coats of red oxide paint as primer and

one coat of bituminous paint before erection for 1/6 length which is to be buried in

ground & after erection remaining portion to be painted by two coats of aluminium paint.

The pole shall be erected in provided pit with cement concrete foundation and muffing in perfect plum.

### **Mode of Measurement:**

Executed quantity will be measured on number basis. (i.e. each)

## 8.2 PSC Poles (PSC)

### PSC Poles (OH-PL/PSC)

#### Scope:

#### Specification No (OH-PL/PSC)

Supply and erection of PSC Rectangular pole in provided foundation as per IS 13158

1991, and as per method of construction mentioned below.

#### Material:

PSC Rectangular Poles as per Specifications in Table 8/3 and as per satisfactory tests minimum required as per IS.

**Table 8.2/3**

#### Specifications for PSC Poles

Top Cross section in mm	Bottom Cross section in mm	Length in metre	Weight in kg
90x102	90x275	8	140
105x115	105x315	9	200

#### Method of construction:

The pole shall be erected in provided pit with cement concrete foundation and muffing

or as instructed by site-in-charge in perfect plum. 1/6th of the total length of pole shall

be buried in ground. The poles shall not to be used for end pole, large angle

**pole (angle more than 300), cut point or span length more than 65 mtr length,**

**where heavy vehicular traffic exists and to be used for straight poles or small**

**angle pole.**

#### Mode of Measurement:

Executed quantity will be measured on number basis. (i.e. each)



### **8.3 Hot dipped Galvanized poles & High Mast (HM)**

#### **A) High Mast (OH-PL/HM)**

##### **Scope:**

##### **Specification No (OH-PL/HM)**

Supplying and erecting 12.5 m /16 m / 24 m high-mast and its accessories as specified

below.

##### **Material:**

Hot dipped galvanised pole with details as given in the Table below;

[\(Refer drawing no. OH-PL-1 & OH-PL-2\)](#)

The design life of high mast shall be minimum 25 years.

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

Height	12.5 m without Power Tool	12.5 m with Power Tool	16 m Power Tool	20 m Power Tool	Remarks
1. Material	Hot dipped galvanised as per specification BSEN ISO 1461	Hot dipped galvanised as per specification BSEN ISO 1461	Hot dipped galvanised as per specification BSEN ISO 1461	Hot dipped galvanised as per specification BSEN ISO 1461	Each section shall be fabricated out of individual plates duly folded and welded. There shall be only one longitudinal seam weld per section. Hot deep internally and externally having uniform thickness of 85 microns for bottom section and 65 microns for top and middle section
Top and bottom Dia. Thickness	110 mm and 242 mm thickness 3 / 3 mm	150 mm and 360 mm thickness 3/3 mm	150 mm (thickness 3mm) and 460 mm (thickness 4mm)	150 mm (thickness 3mm) and 460 mm (thickness 4mm)	
Overlap	1.5 times the Dia	1.5 times the Dia	1.5 times the Dia	1.5 times the Dia	At site sections shall be joined together by slip-stressed- fit method. No site welding or bolted joints shall be done to the mast.
Max. Dynamic loading to withstand Max. Wind pressure	As per IS 875 part 3	As per IS 875 part 3	As per IS 875 part 3	As per IS 875 part 3	Max. Dynamic loading to withstand Max. wind pressure
Opening of base door	175 X 500 mm	225x1050 mm	1200 X 250 mm	1200 X 250 mm	
Double internal lock	Yes	Yes	Yes	Yes	
Base plate	20 mm thick 320 X 320 mm	25 mm thick 520 mm Dia	25mm thick 670mm Dia	30 mm thick 670mm Dia	The welding connection of the base flange shall be fully developed to the strength of the entire section. The base flange shall be provided with supplementary gussets between the bolt- holes to ensure elimination of helical stress concentration.
Anchor plate	3 mm	5 mm	8 mm	8 mm	

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

2. Accessories	12.5 m	12.5 m	16 m	20 m	Remarks
Lantern Carriage arrangement	Hexagonal Lantern Carriage for 6 fittings symmetrically	Lantern carriage of 50 NB ERW Class-B.M.S pipe covered with PVC sleeve suitable to carry 250 Kg load upto 6 fittings	Lantern carriage of 50 NB ERW Class-B.M.S pipe covered with PVC sleeve suitable to carry 250 Kg load upto 8 fittings	Lantern carriage of 50 NB ERW Class-B.M.S pipe covered with PVC sleeve suitable to carry 250 Kg load upto 8 fittings	Hot deep, in two halves with stainless steel bolts and lock type stainless steel nuts to ensure easy installation, lining with protective PVC arrangement. junction box of cast aluminium-weather proof
Raising and lowering mechanism	----	Yes	Yes	Yes	Completely self sustaining Winch fixed at the base without the need of brake shoe, spring or clutches. Gravity activated pawls. Gear ratio 53:1, with self lubricating oil bath
Head frame	Yes	Yes	Yes	Yes	Galvanised
MCB erected on PVC board	Yes	Yes	Yes	Yes	OF suitable rating.

**3. Lighting protection** - By G.I. single spike 1200mm at top

**4. Trailing** - PVC sheathed 5 X 2.5 Sq. mm copper cable

**5. Winch** - Double drum, oil bath (SAE 90/140) with lubrication arrangement

**6. Wire rope** - 2 Nos stainless steel wire rope 7/19, 6mm dia. Breaking load capacity 2400 Kgx2

**7. Integral power tool** - 3 Ph 1 HP 2m/ min single speed,

**8. Torque limiter** - Upto 500Kg adjustable

**9. Aviation obstruction light** - Twin dome with 2 Nos 100W GLS/LED lamp

**Standards applicable:**

**a) I.S. 875 (part- III) 1987 - Code and practice for design for**

**structures**

**b) BSEN10-025/DIN17100 - Grades of M.S plates**

**c) B.S 5135/AWS - Welding**

**d) B.S. ISO1461 - Galvanising**

**e) TR. No.7 2000 of ILE UK - Specification for Mast and**

**foundation**

**Manufacturer of the Mast must have conducted wind tunnel test on their Mast**

**sample.**

**Mode of Measurement:**

Executed quantity will be measured on number basis (i.e. each)

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## **B) Octagonal Poles (OPL)**

**Scope:**

**Specification No (OH-PL/OPL)**

Supplying and erecting 9 m high galvanised octagonal pole details are as specified

below.

<b>Particulars</b>	<b>CSR Item No 8-3-3</b>	<b>CSR Item No 8-3-4</b>
<b>Material</b>	Galvanised as per specification	Hot dipped galvanised as per specification BSEN ISO 1461
<b>Top and bottom Dia. Thickness</b>	100 mm A/F and 200 mm A/F thickness 3mm HT plate	70 mm A/F and 155 mm A/F thickness 3mm HT plate
<b>Bracket</b>	1500 mm long decorative sword type single arm bracket	1500 mm long decorative sword type double arm bracket

**Method of construction:**

The pole shall be erected in provided cement concrete foundation specially designed.

Erection shall be in plum.

**Mode of Measurement:**

Executed quantity will be measured on number basis (i.e. each)

**8.4 Brackets (BKT)**

**A) Pole Bracket (Cross arm) (OH-PL/BKT)**

**Scope:**

**Specification No (OH-PL/BKT)**

Supply and erection of MS Pole Bracket for erection of L T insulators on provided pole.

**Material:**

**Pole Bracket:** MS pole bracket fabricated as per specifications in Table 8.4/1.

Thickness and size of channel is to be checked from the steel table.

**Table No 8.4/1**

**Details of Pole Brackets**

Item No	Material of bracket	Length	No of insulator	No of insulator	Guarding Extension piece	Remark
8-4-1	Angle iron 50x50x6 mm	550 mm	2	2		For LT guarding for vertical formation
8-4-2	Angle iron 50x50x6 mm	750 mm	2	2		For LT guarding for horizontal formation
8-4-3	ISMC Channel 75x40x 6.8 mm	550 mm	4	4		For LT 3 phase 4 wire vertical formation

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8-4-4	ISMC Channel 75x40x 6.8 mm	750 mm	5	5		For LT 3 phase 5 wire vertical formation
8-4-5	ISMC Channel 75x40x 6.8 mm	550 mm	2	2		
8-4-6	ISMC Channel 75x40x 6.8 mm	1100 mm	4	4		
8-4-7	ISMC Channel 75 x40x 6.8 mm	550 mm	2	2	300mm of same channel	
8-4-8	ISMC Channel 75 x40x 6.8 mm	1100 mm	4	4	300mm of same channel	

**D' type Clamps:** MS Flat of 50x6mm, 15 mm MS nut bolts

**Paint:** Silver paint, Red oxide paint

**Method of construction:**

The cross arm shall be made up of size of channel mentioned in above table. The length shall be as stated above table. The cross arm shall be complete with pole clamp of size 50X6 mm MS flat and holes required for pin / shackle insulator. For MS

pole bracket with guarding extension, an extension piece of same size of length 300

mm shall be welded to bracket as per drawing attached herewith. The cross arm and

pole clamp shall be painted with one coat of red oxide and two coat silver enamel

paint any other colour paint (as per the instructions of engineer in-charge).

Cross arm shall be fabricated **as per drawing no. OH-PL/BKT-1 ( Fig.2 & Fig.3)**

.

**Mode of Measurement:** Executed quantity will be measured on number basis. (i.e.

Each)

## **B) Vee Cross Arm (OH-PL/VCA)**

### **Scope:**

### **Specification No (OH-PL/VCA1)**

Supplying Vee cross arm, suitable for 11 kV and necessary ancillary materials complete

erection on provided pole with necessary painting as per specification and as per instructions from the site engineer.

### **Material:**

**Cross arm:** Channel Iron cross arm

**Hardware:** G.I. nut bolts

**Flat:** MS flat 80 x 10 mm thick

**Clamp:** Two clamps made from MS flat of size 80 x 10 mm.

**Paint:** Red oxide, Silver paint.

### **Method of construction:**

Fabricating the Vee cross arm for erecting Insulators with channel 75 x 40 mm with

4.4 mm thick web and 7.3 mm thick flange, length of 45 mm for base of insulator,

vertical member of suitable length to maintain the clearance of 1220 mm, with angle of 60

degrees to horizontal and M.S. flat of 80 x 10 mm at centre of cross arm fixed to the pole

by means of two M.S. clamps of 80 x 10 mm. M.S. flat with 15mm. dia bolts and nuts

duly painted with one coat of red oxide paint and two coats of aluminium paint. Cross arm

shall be fabricated **as per drawing no. OH-PL/BKT-1 ( Fig.1)**

***Detailed specifications of material of the items included in CSR are given in***

***Table No 8.4/2.***

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

### **C) Vee Cross Arm (OH-PL/VCA)**

**Scope:**

#### **Specification No (OH-PL/VCA2)**

Supplying Vee cross arm, suitable for 22 kV and necessary ancillary materials complete

erection on provided pole with necessary painting as per specification and as per instructions from the site engineer.

**Material:**

**Cross arm:** Channel Iron cross arm

**Hardware:** G.I. nut bolts

**Flat:** MS flat 80 x 10 mm thick

**Clamp:** Two clamps made from MS flat of size 80 x 10 mm.

**Paint:** Red oxide, Silver paint.

**Method of construction:**

Fabricating the Vee cross arm for erecting Insulators with channel 75 x 40 mm with

4.4 mm thick web and 7.3 mm thick flange, length of 45 mm for base of insulator,

vertical member of suitable length to maintain the clearance of 1530 mm, with angle of

60 degrees to horizontal and M.S. flat of 80 x 10 mm at centre of cross arm fixed to

the pole by means of two M.S. clamps of 80 x 10 mm. M.S. flat with 15mm. dia bolts



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and nuts duly painted with one coat of red oxide paint and two coats of aluminium

paint. Cross arm shall be fabricated **as per drawing no. OH-PL/BKT-1 ( Fig.1)**

**Detailed specifications of material of the items included in CSR are given in**

### **Table No 8.4/2.**

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

### **Table No 8.4/2**

#### **Details of Iron Cross Arm / Bracket as Per Item in CSR**

Item No.	Item description	Size of channel	Clamps	Nut bolts
8-4-11	100X50 channel cross arm	100 x 50 mm. with 4.7 mm thick web and 7.5 mm thick flange channel X 2.7 m length	Two clamps of 50x6mm. M.S. flat	15mm. nuts and bolts
8-4-12	Vee-cross arm	made out of channel 75 x 40 mm with 4.4 mm thick web and 7.3 mm thick flange with clearance of 1220 mm. between the insulators as per drawing attached here with	Clamps of 75x10 mm of MS Flat	15mm. dia bolts and nuts
8-4-13	Vee-cross arm	100x50 mm with 4.7 mm thick web and 7.5 mm thick flange size suitable with clearance of 1530 mm. between the insulators	Clamps of 75x10 mm of MS Flat	15mm. dia. bolts and nuts
8-4-14	Channel with clamp for erection of 11/22 KV pin insulators	75x40 mm with 4.4 mm thick web and 7.3 mm thick flange channel	Clamps of 80x10 mm of MS Flat	with 3 sets screws
8-4-15	Channel bracket for guarding	channel iron 1600 mm. in length and 75x40 mm. with 4.4 mm. thick web and 7.3 mm thick flange	Clamps of 50x6 mm of MS Flat	15mm. dia nuts and bolts with 2 earthing clips, made from 25x3 mm
8-4-16	Angle iron bracket for guarding	Angle iron bracket 65 x 65 x 6mm. Angle 1600 mm. in length and 75x40 mm. with 4.4 mm. thick web and 7.3 mm thick flange	Clamps of 50x6 mm of MS Flat	15mm. dia nuts and bolts with 2 earthing clips, made from 25x3 mm

## **8.5 Conductors (CON)**

### **A) All Aluminium Conductors (AAC) (OH-CON/AAC)**

#### **Scope:**

**Specification No (OH-CON/AAC)**

Supply and erection of All Aluminium Conductors for overhead line.

**Material:**

**Conductor:** All aluminium stranded conductor (As per table 8.5/1)

**Binding wire:** 12 SWG aluminium binding wire

**Clamps:** PG clamps as per requirement

**Method of construction:**

At first the conductor is removed from bundle/drum straighten without knots, bends,

etc.

Stringing of conductor shall be done with draw vice. Conductor shall not be twisted

while stringing. Shackle insulators shall be used if the line deviates by 30 degrees or

more, at terminal pole and at junction/ cut pole.

Parallel double groove clamp having two nut bolts designated to carry full line current

shall be used for making Jumper wire connections.

On straight line the conductor shall be bounded on top groove of insulator and at angular

position binding shall be done in side groove. Binding wire of 12 SWG shall be of the same

metal as that of conductor.

**Mode of Measurement:**

For measurement purpose, sum of the total conductor including jumper connections

shall be considered. (i.e. per km)

**B) Aluminium Conductor Steel Reinforced (ACSR) (OH-CON/ACSR)**

**Scope:**

**Specification No (OH-CON/ACSR)**

Supply and erection of aluminium conductor steel reinforced for overhead line.

**Material:**

**Conductor:** All aluminium conductor steel reinforced (As per table 8.5/1)

**Binding wire:** 12 SWG aluminium binding wire

**Clamps:** PG clamps as per requirement

**Method of construction:**

At first the conductor is removed from bundle/drum straighten without knots, bends,

etc.

Stringing of conductor shall be done with drawing vice. Conductor shall not be twisted

while stringing. Disc insulators shall be used if the line deviates by 30 degrees or more, terminal pole and tri-pole or four pole structure at terminal pole and at junction/

cut pole.

Parallel double groove clamp having two nut bolts designated to carry full line current

shall be used for making Jumper wire connections. Universal parallel double groove

clamp having two nut bolts shall be used for Tap Off point.

On straight line the conductor shall be bounded on top groove of insulator and at angular

position binding shall be done in side groove. Binding wire of 12 SWG shall be of the same

metal as that of conductor.

**Mode of Measurement:**

For measurement purpose, sum of the total conductor including jumper connections

shall be considered. (i.e. per km)

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**Table No. 8.5/1**

**Conductor Specifications As Per I.S. 398/1961**

Code Name of Conductor	Resistance at 20° ohm /km.	Approx. Current Carrying Capacity in Amperes.		Number of Strands / Diameter of each Strand in mm	Overall Diameter of Conductor in mm	Weight of Conductor ( kg/km)
		At 40° C	At 45° C			
<b>All Aluminium Conductor</b>						
Rose	1.361	116	108	7/1.96	5.88	58
Gnat	1.071	133	123	7/2.21	6.63	73
Irish	0.850	150	138	7/2.48	7.44	92
Pansy	0.677	178	165	7/2.78	8.34	116
Ant	0.544	204	189	7/3.10	9.30	144
<b>ACSR Conductor</b>						
Squirrel	1.374	115	107	6+1/2.11	6.33	85
Weasel	0.911	150	139	6+1/2.59	7.77	128
Ferret 4.04	0.679	181	618	6+1/3.0	9.00	171
Mink 0.06	0.456	234	217	6+3.66	10.98	255
Raccoon	0.365	270	250	6+1/4.09	12.27	318
Dog 0.1	1.137	520	482	30+7/3.0	21.00	976

**Table No 8.5/2**

**Minimum Clearance between Conductors**

**(IS: 4237-1967)**

S.No.	Voltage level (kV)	Clearance in mm	
		Between Phases	Between Phase & Earth
7.	11	460	305
8.	22	610	460
9.	33	915	610
10.	110	1675	1000
11.	230	3350	1675
12.	400	4000	3500

## 8.6 Insulators (INS)

### A) Porcelain Disc Type Insulator 11/22/33 kV (OH-INS/DI)

#### Scope:

#### Specification No (OH-INS/DI)

Supplying porcelain disc type insulator, suitable for 11/22/33KV and necessary ancillary

materials and complete erection on provided cross arm / bracket and connected to the overhead

line as per instructions from the site engineer

#### Material:

**Insulator:** Distribution class Disc type insulator made from porcelain, suitable for specified

voltage level, having ISI mark, with necessary hardware.

**Hardware:** Nuts, washers, etc.

**Binding wire:** Bare Copper wire or conductor.

**Clamps:** MS clamps.

#### Method of construction:

Distribution class porcelain disc type insulator, suitable for specified voltage level,

erected on provided cross arm or bracket with clamps, ancillary materials, and connected to the over-head line. Connection shall be made with bare copper wire of

specified gauge.

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

### **B) Pin Type Insulator 11/22/33 kV (OH-INS/PN)**

#### **Scope:**

#### **Specification No (OH-INS/PN)**

Supplying porcelain Pin type insulator, suitable for 11/22/33KV and necessary ancillary

materials and complete erection on provided cross arm / bracket and connected to the overhead

line as per instructions from the site engineer

#### **Material:**

**Insulator:** Distribution class Pin type insulator made from porcelain, suitable for specified

voltage level, having ISI mark, with necessary hardware.

**Hardware:** Nuts, washers, etc.

**Binding wire:** Bare Copper wire or conductor.

**Clamps:** MS clamps.

#### **Method of construction:**

Distribution class porcelain pin type insulator, suitable for specified voltage level, erected

on provided cross arm or bracket with clamps, ancillary materials, and connected to the overhead

line. Connection shall be made with bare copper wire of specified gauge.

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

### **C) Post Type Insulator 11/22/33 kV (OH-INS/PST)**

#### **Scope:**

**Specification No (OH-INS/PST)**

Supplying porcelain Post type insulator, suitable for 11/22/33KV and necessary ancillary

materials and complete erection on provided cross arm / bracket and connected to the overhead

line as per instructions from the site engineer

**Material:**

**Insulator:** Distribution class Post type insulator made from porcelain, suitable for

specified voltage level, having ISI mark, with necessary hardware.

**Hardware:** Nuts, washers, etc.

**Binding wire:** Bare Copper wire or conductor.

**Clamps:** MS clamps.

**Method of construction:**

Distribution class porcelain post type insulator, suitable for specified voltage level,

erected on provided cross arm or bracket with clamps, ancillary materials, and

connected to the over-head line. Connection shall be made with bare copper wire of

specified gauge.

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

**D) Thyrite type Lightning Arrestor 11/22 kV (OH-INS/LA)**

**Scope:**

**Specification No (OH-INS/LA)**

Supplying porcelain Thyrite type lightning arrestor, suitable for specified voltage level and

necessary ancillary materials and complete erection on provided cross arm / bracket and

connected to the over-head line as per instructions from the site engineer.

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**Material:**

**Arrestor:** Distribution class Thyrite type lightening arrestor made from porcelain, suitable

for specified voltage level, having ISI mark.

**Hardware:** Nuts, washers, etc.

**Binding wire:** Bare Copper wire or conductor.

**Clamps:** MS clamps.

**Method of construction:**

Distribution class porcelain Thyrite type lightening arrestor, suitable for specified voltage

level, erected on provided cross arm or bracket with clamps, ancillary materials, and connected

to the over-head line. Connection shall be made with bare copper wire of specified gauge.

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

**DRAWINGS**

OH-1 : Overhead Line Distribution System

OH-2 : Overhead Line Distribution System

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## **EARTHING**

### **9.1 Plate, Pipe EA-EP/**

### **9.2 Accessories No Specs**

### **9.3 Drawings**

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## **Chapter 9 Earthing (EA)**

### **9.1 Plate / Pipe type Earthing**

#### **A) Plate type Earthing (With or Without CI Cover, Funnel, etc) (EA-EP)**

##### **Scope:**

##### **Specification No (EA-EP)**

Supplying and erecting galvanised cast iron / copper earth plate type / G.I. pipe type

earthing **with / without C.I. cover** as per instructions from the site engineer.

##### **Material:**

**Earth Plate:** Galvanised cast iron / Copper earth plate or G.I. pipe as per specifications

given in Table No 9.1/1.

**CI Cover:** As per specifications given in Table No 9.1/1.

**Earthing Conductor:** Copper/G.I strip/Annealed bare copper wire/G.I. earth wire of size as

per specifications given in Table No 9.1/1.

**GI Pipe:** As per specification **(CW-PLB/GP)** mentioned chapter no. 17.5 for watering, and

as enclosure for Earth wire, refer specifications given in Table No 9.1/1.

**Hardware:** Screw / nut bolts with required washer of dimensions, Rawl plug / clip/ 'U' nails

and material as per specifications given in Table No 9.1/1.

**Filling material:** Coal /Charcoal/ salt as per specifications given in Table No 9.1/1.

as per specifications given in Table No 9.1/1.

**Lugs:** As per specification **(CB-LG/AL, CB-LG/CU)** mentioned chapter 7.9 & 7.10 Copper/

Aluminium lugs as per specifications given in Table No 9.1/1.

**Method of construction:**

Pit is to be dug of required dimension and depth for the earthing at site, and laying of

Galvanised cast iron / Copper earth plate or G.I. pipe shall be as per Table No 9.1/1. The

earth connection to equipment/ switch gear and earthing electrode shall be connected as

shown in the diagram and as per IS 3043 amended up to-date. The connections shall be

made either by strip or double run of earth wire with drilling, welding, riveting, brazing and

nut bolting to plate or pipe, where ever required in an approved manner. As far as possible

continuous strip shall be used, but where ever jointing of strip is unavoidable, the overlap

portion must not be less than **21/2** times the width of the strip either welded/ brazed/soldered by all sides or 6 inches overlap with two nut bolts/ riveting of adequate size with required washer and covered by anti-corrosive paint as per approved

jointing practice in the industry and as per directives from site engineer in charge.

Pit shall then be filled with screened soil with alternate layer of coal and salt, and if,

necessary brick masonry work ( Where ever applicable) shall be done as specified in IS:

3043, with laying wires in PVC/ G.I. pipe and watering arrangement as per [drawing no EA-1](#)

and covered with C.I. Cover ( Where ever applicable).

Where ever requires or as specified by Site Engineer, a Test link shall be provided for

facilitating the testing of resistance of earth electrode.

**Testing:**

The value of each earth electrode shall be measured by earth tester in presence of

site Engineer and record to be submitted.

**Mode of Measurement:** Executed quantity will be measured on number basis (i.e.

each)

**Table No 9.1/1****Detailed Specifications of various types of Earthing**

Type of earthing ----->	Galvanised cast iron earth plate type without C.I cover	Copper earth plate type with C.I cover	Galvanised cast iron earth plate type with C.I cover	Pipe type earthing with out C.I cover	
S.No.	Particulars				
1)	Depth from top of plate Up to Ground level	1.5 m	1.5 m	1.5 m	1.5 m
2)	Size & type of material for pipe / Plate type earthing.	Cast iron earth plate size 60x60x0.6 cms	Copper earth plate size 60x60x0.6 cms	cast iron earth plate size 60x60x0.6 cms	'B' grade G.I. pipe 40mm. dia. 2.5 mtr. Long or 20 mm dia. G.I. Rod
3)	Salt/charcoal	30 Kg. charcoal and salt each	30 Kg. charcoal and salt each	40 Kg. charcoal and salt each	N A
4)	Type of Wire	Double G.I. wire 8 SWG	Double G.I. 8 SWG	Double G.I. 6 SWG	double G.I. 8 SWG
5)	Wire enclosure	12mm. dia. G. I. pipe 2 mtr. Long	12mm. dia. G. I. pipe 2 mtr. Long	12mm. dia. G. I. pipe 2.5 mtr. Long	N A
6)	Nut bolts	12 mm dia. Cadmium / GI	12 mm dia. Cadmium / GI	12 mm dia. Cadmium / GI	N A
7)	Washers	GI	GI	GI	N A
8)	Watering pipe	19mm. dia. G.I. pipe	19mm. dia. G.I. pipe	19mm. dia. G.I. pipe	N A
9)	Lugs	Yes	Yes	Yes	Yes
10)	funnel	No	yes	yes	N A
11)	Brick Masonry	No	yes	yes	N A

**B) Low Impedance Earthing (Pipe in pipe technology) (EA-EPP)****Scope:****Specification No (EA-EPP)**

Supplying and erecting approved type earthing system with **Pipe in pipe technology**

with necessary ancillary materials and complete erection as per instructions from the

site engineer

**Material:**

**GI Pipe:** As per specification no. **(CW-PLB/GP)** mentioned chapter 17.5;

1. 50 mm dia x 3 meter long (In place of traditional GI pipe Earthing), for LV / MV

applications.

**Or**

2. 80 mm x 3 meter long (In place of traditional copper plate Earthing), for HV/EHV

applications.

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**Earthing Conductor:** G.I strip/GI earth wire of size as per specifications given in

Table No 9.1/1.

**GI Pipe:** As per specification no. **(CW-PLB/GP)** mentioned chapter 17.5 for watering and

as enclosure for Earth wire, as per specifications given in Table No 9.1/1.

**Hardware:** Screw / nut bolts with required washer of dimensions, Rawl plug / clip/ 'U' Nails

and material as per specifications given in Table No 9.1/1.

**Filling material:** Coal /Charcoal/ salt as per specifications given in Table No 9.1/1.

as per specifications given in Table No 9.1/1.

**Lugs:** As per specification no. **(CB-LG/AL, CB-LG/CU)** mentioned in chapter 7.9 & 7.10 for

Copper/ Aluminium lugs and as per specifications given in Table No 9.1/1.

**Method of construction:**

Earthing Pipe in pipe technology with ancillary materials shall be done by digging an 8" /

10" dia hand bore 10.5' deep sufficient to install the electrode in normal soil conditions. The

space between the soil and the electrode is filled up with electrolyte material mixed with the

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

dug out mother soil, along with water and tightly packed up to the base of the terminal. In

rocky areas and under hard soil and sandy soil conditions the method of installation will be

as specified by manufacturer. Installation shall include drilling, welding, reverting, brazing

and nut bolting pipe when ever required in an approved manner with required material such

as nut bolts and washer etc. and with necessary brick masonry work as per the specification. (As per IS 3043 amended up to-date). As far as possible continuous GI strip

shall be used but when ever jointing of strip is un avoidable, the jointing over lap portion

must not be less than **21/2** times the width of the strip either welded/ brazed/soldered by all

sides or overlap of 6 inch with two nut bolts/ riveting of adequate size with required washer

and covered by anti corrosive paint as per approved jointing practice in the industry and as

per directives from site engineer in-charge.

### **Testing:**

The value of each earth electrode shall be measured by earth tester and record to be

submitted. (Also refer drawing No. EA-2 )

**Mode of Measurement:** Executed quantity will be measured on number basis i.e.

Each

### **3.7 On Line UPS (UPS)**

## **General**

This part of the specifications covers the technical aspects of the Online UPS system for 1

to 10 kVA capacity.

## **Scope:**

### **Specification No (AP-UPS)**

Supplying, erecting, testing & commissioning of Online UPS with necessary safeties,

etc.

## **Material:**

Equipment manufactured as per standard manufacturer's specification and as tabulated

in Table No. 3.7/2. The unit housed in powder coated CRCA sheet enclosure with following

fault protection on mains / UPS mode:

- Under voltage on mains mode
- Over voltage on mains mode
- Charger protection on mains mode
- Overload on UPS mode
- Short circuit on UPS mode
- Low battery on UPS mode
- Battery reverse on UPS mode
- Under voltage on UPS mode
- Over voltage on UPS mode
- LED & LCD display for above fault protection
- Alarm for above fault protection
- Batteries shall be of Sealed Maintenance Free type (Tubular). The selection of

number of batteries required shall be as per Table No 3.7/1

**Table No. 3.7/1**

**Details of Batteries required for the UPS in respect to the Backup Period.**

kVA rating	DC Voltage	Output pf	No of SMF Batteries	Back Up Period				
				15 mins	30 mins	1Hr	2Hrs	3Hrs
1kVA	36V	0.7	3	17AH	2X17 AH	42 AH	65 AH	100 AH
2kVA	96V	0.7	8	17AH	26 AH	65 AH	65 AH	100 AH
3kVA	192V	0.8	16	17AH	17 AH	26 AH	42 AH	65 AH
5/6kVA	192V	0.8	16	17AH	26 AH	42 AH	65 AH	100 AH
8kVA	240V	0.8	20	17AH	26 AH	42 AH	100 AH	2X65 AH
10kVA	240V	0.8	20	26AH	42 AH	65 AH	65 AH	2X100 AH
<b>A)</b>	The Batteries considered are Sealed Maintenance Free Batteries (SMF)							



<b>B)</b>	The Batteries need to be placed in Ambient Temperature of 20Deg C - 25Deg C
<b>C)</b>	The UPS is considered to be working @ 90% Load of its capacity

**Table No. 3.7/2**

**Specifications & Standard Parameters of On Line UPS**

The UPS shall comply with specifications as indicated in the following table:

<b>S.No.</b>	<b>Specifications / Features</b>	<b>Standard Parameters</b>
1	1 Technology	True online Double Conversion design (DSP / Microprocessor based)
2	2 Input voltage range	160 V to 270 V for 1 Phase Input 335 V to 477 V for 3 Phase Input
3	Input power factor	Near unity Power factor > 0.93 for 1 Phase input
4	Generator compatibility	Yes (1.2 times the UPS rating)
5	Nominal input frequency	50 Hz +/- 6 %
6	Rectifier type	Advance Rectifier with inbuilt APFC (Advance Power Factor Compensated) for 1 Phase. IGBT charger Advance Rectifier with inbuilt APFC (Advance Power Factor Compensated) for

CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

		3 Phase.
7	Output Voltage	230 V AC +/- 1 % for 1 Phase Output. 400 V AC (380/415 selectable) for 3 Phase & Neutral.
8	Total Harmonic distortion	1 Phase Output < 3 % for Linear load < 5 % for Non-linear load 3 Phase Output < 2 % for Linear load < 5 % for Non-linear load
9	Overload Capacity	110 % for 10 Seconds & 130 % for 2 Seconds for 1 & 2 kVA UPS. 125 % for 10 Minutes & 150 % for 60 Seconds for 3 to 10 kVA UPS.
10	Inverter	IGBT based PWM with Digital control (Microprocessor based)
11	Crest Factor	3: 1 for 1 & 2 kVA UPS. 5: 1 for 3 to 10 kVA UPS.
12	Static Bypass	Automatic bypass switch facility
13	Display	Should be User friendly with LED & LCD display with showing important parameters.
14	Output Power factor	0.7 lag to Unity within kVA & kW rating.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

15	Load in terms of PC per kVA. (PC with 15" CRT Monitor)	3 PC's per kVA (for 1 & 2 kVA UPS) 5 PC's per kVA (for 3 to 10 kVA UPS)
16	Battery type	SMF / Thick plate / Tubular
17	DC Voltage	1 kVA – 36 V, 2 kVA – 96 V, 3 & 5 kVA – 192 V, 8 to 10 kVA – 240 V
18	Battery charger current limit	1 & 2 kVA – 6 A, 3 & 5 kVA – 4 & 6 A, 8 & 10 kVA – 8 & 15 A.
19	Ambient temperature	450 C
20	Noise level	< 50 db @ 3 metres
21	Testing standards	IEC 62040 Part III
22	Isolation Galvanic	Isolation transformer from 3 to 10 Kva

**Mode of Measurement:** Executed quantity will be measured on number basis. (i.e.each.)

### Chapter 3 Appliances (AP)

#### 3.2 Air Conditioners

##### A) Window Model Air Conditioners (WAC)

**Scope:**

**Specification No (AP-AC/WAC)**

Supplying, erecting, and testing Window model room air conditioner of specified tonnage,

conforming to I.S.1391 suitable for operation on single phase, AC supply, 230/250 Volts 50

Hz, using best quality compressor, dehumidifier in provided air circulating, ventilators and

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fitting in position in recess or in window to required size, and connected to supply, and

marking of S No. and date of erection.

The AC unit shall be capable of performing following functions:

- Cooling
- Dehumidifying
- Air Circulating
- Air Filtering
- Ventilation

***The Window AC should be of minimum 3 Star rating as directed by B.E.E.***

**Material:**

***Compressor:***

The room air conditioners shall be fitted with hermetically sealed type suction cooled

(Reciprocating) or discharge cooled (Rotary) compressor with suitable rated capacitor start

electric motor. It should start unloaded and shall be equipped with overload protection. The

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

compressor shall be mounted on resilient mountings for quiet operation. The compressor

shall conform to IS.10617 (part-1): 1983 with amendment 1 & 2.

Cooling capacity for Compressors shall be as under:

For 1.5 Ton - Minimum 4750 kcal/hour

For 2.0 Ton - Minimum 6250 kcal/hour

Energy efficiency ratio for Compressor shall be minimum 2.625 kcal/hour/watt.

### **Cabinet:**

The cabinet of the air conditioner be made from either galvanized MS sheet of 1mm

thickness or aluminium alloy sheet of 1.2mm thickness. The sheets shall be suitably

stiffened by embossing the fabrication work and shall be of suitable workmanship.

The sheets shall be suitably phosphate and protected by powder coated paint. The

galvanized steel sheets shall conform to IS: 277:2003 and have a coating grade of

120 gm/m<sup>2</sup>.

**Air Filter:** The air filters provided shall be of cleanable type and made of synthetic

material.

### **Thermostat:**

The air-conditioner shall be fitted with thermostat suitable for a working range from 16

degree Centigrade to 35 degree Centigrade with a differential of +/-1 degree

Centigrade, with operational voltage as 240V and current rating not exceeding 25

amps. The thermostat shall conform to IS: 11338:1985.

**Condenser: As per (FG-FG/AS7) specified in chapter 2.4**

**Paint:** Superior quality enamel paint of specified colour.

**Method of Construction:**

The AC unit shall be fixed in the recess/window with necessary materials.  
The outer frame

shall be fitted to recess or cutout made in window making the  
recess/window air tight, duly

connecting the unit to power supply by means of metal clad switch & plug  
and giving

satisfactory trials.

**Mode of Measurement:** Executed quantity shall be counted on number basis.  
(i.e.each)

**B) Split type Air Conditioners (SAC)**

**Scope:**

**Specification No (AP-AC/SAC)**

Supplying, erecting, and testing Split type room air- conditioner of specified  
tonnage,

conforming to I.S.1391, having one/two air handling units Hi-wall / ceiling  
(suitable for false

ceiling) mounting type having cooling unit and the outdoor condensing unit  
connected with

12/9 mm copper piping up to 6 meter duly insulated and 3 core copper flexible  
cord of

required length etc. with stand for condensing unit, complete with testing etc.  
(Conforming

to IS: 1391 Part-I & Part-II with all amendments & as per BEE) suitable for  
operation on

single phase, AC supply, 230/250 Volts 50 Hz, using best quality compressor,  
and fitting in

position as per site situation and as directed by site engineer, duly connected to  
supply,

and marking of S No. and date of erection.

The AC unit shall be capable of performing following functions:

- Cooling
- Dehumidifying
- Air Circulating
- Air Filtering
- Ventilation

***The Split type AC should be minimum 3 Star rating as directed by B.E.E.***

**Material:**

***Compressor:***

The air conditioners shall be fitted with hermetically sealed type suction cooled reciprocation or discharge cooled rotary compressor (as applicable), compressor unit

operating on Refrigerant R-22 with suitable rated capacitor start electric motor. It shall

be equipped with overload protection. These shall be mounted on resilient mountings

for quiet operation. The compressor shall conform to IS: 10617 part (1) -1983 (amendment 1 & 2)

The air conditioners shall be complete with automatic temperature control and cut-in

and cut-out etc. for temperature range 16 degrees to 35 deg. C. The differential of the

thermostat for cut-in and cut-out shall not be greater than +/- 1 degree Centigrade.

***Outdoor Cabinet:***

The cabinet of the evaporator unit and condensing unit shall be made from galvanized steel

sheet of 1.0mm thick with stiffness for robust construction and shall have rounded corners,

steel parts/front panel etc. shall have stove-enameled finish preceded by undercoat of anti

corrosive primer paint phosphate and through cleaning of the surface. Alternate method of

corrosion protection like plastic powder coating, electrostatic paintings are also acceptable

in lieu of stove enameled finish. Galvanized sheet shall conform to IS: 277/2003.

**Indoor Unit:**

The indoor units made of ABS/HIPS shall be of flame retardant and impact resistant life.

ABS/HIPS indoor unit cabinet shall pass in flammability test requirement for Grade V-O as

per UL -94. For impact resistance the unit duly packed, when dropped from a height of 1

metre shall show no damage.

**Air Filter:** The air filters provided shall be of cleanable type and made of synthetic

material.

**Thermostat:** Thermostat or electronic thermostat as per IS 11338: 1985.

**Condenser:** As per **(FG-FG/AS7)** specified in chapter 2.4

**Piping:**

**Suction line** -Copper pipe of min 0.70mm thickness and of suitable diameter as per manufacturers design.

**Liquid line** -Copper pipe of min 0.70mm thickness and of suitable diameter as per manufacturers design.

**Drain pipe** -15mm dia flexible PVC pipe.

**Connection Cable:** Suitable capacity 3 Core PVC insulated FRLS copper wire to be electrically connected to both the units.



**Paint:** Superior quality enamel paint of specified colour.

**Remote Control:** Remote control (Cordless) shall be provided with one On/Off timer,

selecting Fan speed(Three speeds) and setting up of temperature.

**Drain Pipe:** Drain pipe (15mm dia flexible PVC pipe).

**Method of Construction:**

The installation shall comprise the following work:

- Mounting/Fitting indoor & outdoor units at the respective locations on provided MS stands

with necessary hardware's.

- Laying refrigerant piping of 6m length and connecting both the units after drilling hole/holes

in the wall, if required. The thickness of the copper tubing shall not be less than 0.70mm

and diameter of required size by flaring, threading, etc.

- Insulating the suction pipe with expanded polyethylene of foam 5mm tubing.

- Laying 15mm drain pipe to throw out the condensate water formed in the Indoor unit.

- Leak testing of the entire system.

- Charging Refrigerant gas in the unit.

- Suitable electric wiring between indoor and outdoor units up to 6 m length & up to switch

within 3 metre of location of indoor unit.

- Testing and giving satisfactory trials.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **Chapter 13 FIRE FIGHTING & FIRE ALARM SYSTEM (FF)**

### **13.1 Main Fire Pumps (Single Stage Centrifugal) (FF-MFP/SSC)**

### **13.2 Main Fire Pumps (Multi Stage Centrifugal) (FF-MFP/MS)**

### **13.4 Jockey Pumps (FF-MFP/JP)**

### **13.5 Booster Pumps (FF-MFP/BP)**

#### **General:**

Fire safety in building has become very important consideration in construction and maintenance. A normal office building has fire load in the form of large quantity of papers and furnishing. Buildings like Hospitals, Laboratories, Auditorium, Libraries, and Museum etc. require fire safety provisions by virtue of their type of occupancy and importance irrespective of their height.

The design and installation of a fire fighting system is of utmost importance. The fire fighting installation on completion will have to be got cleared from the local fire fighting authorities (Fire Service) for its efficacy, suitability and usability by the Fire Service in the event of a fire.

Following types of water based fixed fire fighting installations are normally provided in buildings:

#### ***Wet Riser.***

#### ***Down Comer.***

#### ***Automatic Sprinkler.***

The design of fire fighting system for a building shall base as per the provisions in National Building Code of India (Part IV) (Amended up to date) and also considering the provisions in the Development Control Rules of local body/authority.

The operating pressure of individual hydrant shall be between 5.5 kg/cm<sup>2</sup> to 3.5 kg/cm<sup>2</sup>

and the operating pressure of the furthest level hydrant from main pump shall be minimum

3.5 kg/cm<sup>2</sup>.

The pipeline will be designed in such a way that it should be possible to get discharge at any location.

### **Specifications:**

This part deals with the specifications of following pumps:

#### **Specification No(s)**

**1. Main Fire Pumps (Single Stage) (FF-MFP/SSC)**

**2. Main Fire Pumps (Multi Stage) (FF-MFP/MSC)**

**3. Jockey Pumps (FF- MFP/JP)**

**4. Booster Pumps (FF-MFP/BP)**

#### **Scope:**

Supplying, installing, testing, perfect aligning, proper levelling and commissioning of Fire service main/jockey/booster pump single/multi stage having specified discharge and head with required HP or similar to with minimum parameters, confirming to IS: 1520 with specified size of suction and delivery pipes, coupled with squirrel cage A.C. induction motor. The pump set shall be erected in alignment on cement concrete foundation.

The Main Fire pumps should be able to deliver minimum operating pressure of 3.5 kg/cm<sup>2</sup> at highest and farthest hydrant.

Selection of Main Fire Pumps (Single & Multi Stage Centrifugal type) shall be as per Table No. 13.1/1, & 13.1/2 and, whereas the selection of Jockey Pump (Centrifugal type) & Booster Pump (Centrifugal type) shall be as per Table No. 13.1/3 & 13.1/4 respectively.

**Material:**

***Pump Body:***

The centrifugal pumps shall conform to IS 1520. The pump casing shall be of heavy

section close grained cast iron and designed to withstand 1.5 times the working pressure. The

casing shall be provided with shaft seal arrangement as well as flanges for suction and delivery

pipe connections as required.

***Impeller:***

The impeller shall be bronze. This shall be shrouded type with machined collars. Wear rings, where fitted to the impeller, shall be of the same material as the impeller. The impeller surface shall be smooth finished for minimum frictional loss. The impeller shall be secured to the shaft by a key.

***Shaft:***

The shaft shall be of stainless steel EN-8/ C – 40 and shall be accurately machined.

The shaft shall be balanced to avoid vibration at any speed within the operating range of

the pump.

***Shaft Sleeve:***

The shaft sleeve shall be of bronze.

***Bearing:***

The bearing shall be of stainless steel and of ball or roller type suitable for duty involved. These shall be grease lubricated and shall be provided with grease nipples /cups. The bearings shall be effectively sealed against leakage of lubricant or entry of dust or water.

**Shaft seal:**

The shaft seal shall be mechanical type so as to allow minimum leakage. A drip well shall be provided beneath the seal.

**Motor:**

Suitable HP squirrel cage induction motor, TEFC (totally enclosed fan cooled) synchronous speed 2900 RPM, suitable for operation on 415 volts, 3 phase 50 Hz. AC with IP 55 protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325.

**Body:** Cast iron

**Rotor Shaft:** Stainless steel

**Bearing:** Refer specification for bearing under Pump above.

**Winding:** Class 'F' insulated copper winding.

**Base plate:** Fabricated from Mild Steel, foundation bolts etc.

**Cement Concrete Foundation:** Cement, Sand, and Water, in 1:2:4 ratio.

**Anti Vibrating Pads:** Made from high quality rubber of specified grade and strength.

**Hardware:** Mild Steel

**Method of Construction:**

The surface of the pump foundation should be chipped with pneumatic hammer or sharp pointed chisel. The teak wood box of appropriate size shall be placed and filled with cement concrete in 1:2:4 ratio with 20 to 25 mm stone metal and required size and strength of foundation nut & bolts. The necessary curing & finishing shall be done in approved manner. The M.S. fabricated base plate of suitable size & strength should be fixed with anti-vibration rubber pads. Proper levelling and alignment shall be observed before tightening of foundation bolts. Both the pump and motor shall be

placed on common base plate frame with perfect alignment, proper levelling. The pump should be connected to pipe line with M.S. flanges, gaskets, nut bolt etc and shall be checked for the leakages. The coupling guard shall be provided with nut bolts of required size. The pump shall be tested for 3.5 kg/cm<sup>2</sup> pressure at highest and farthest point of the building for minimum 2 hours. The necessary test certificate from manufacturer of pump and motor shall be produced. The motor should have efficiency more than 90% and power factor above 0.80.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**Table No. 13.1/1**

**Fire Fighting pump (Single Stage Centrifugal)**

Capacity in HP	Speed in RPM	Discharge in LPM	Head in metre	Suction/Delivery Size in mm
<b>30</b>	<b>2900</b>	<b>1400</b>	<b>56</b>	<b>80/65</b>
<b>50</b>	<b>2900</b>	<b>1800</b>	<b>76</b>	<b>80/65</b>
<b>75</b>	<b>2900</b>	<b>2400</b>	<b>76</b>	<b>100/80</b>

**Table No. 13.1/2**

**Fire Fighting pump (Multi Stage Centrifugal)**

Capacity in HP	Speed in RPM	Discharge in LPM	Head in metre	Suction/Delivery Size in mm
<b>30</b>	<b>1450</b>	<b>1400</b>	<b>56</b>	<b>80/65</b>
<b>50</b>	<b>1450</b>	<b>1800</b>	<b>76</b>	<b>100/80</b>
<b>75</b>	<b>1450</b>	<b>2400</b>	<b>88</b>	<b>125/100</b>
<b>75</b>	<b>1450</b>	<b>2800</b>	<b>76</b>	<b>125/100</b>
<b>120</b>	<b>1450</b>	<b>2800</b>	<b>105</b>	<b>150/125</b>

**Table No. 13.1/3**

**Jockey Pump (Centrifugal type)**

Capacity in HP	Speed in RPM	Discharge in LPM	Head in metre	Suction/Delivery Size in mm
<b>15</b>	<b>2900</b>	<b>240</b>	<b>56</b>	<b>50/32</b>
<b>20</b>	<b>2900</b>	<b>240</b>	<b>105</b>	<b>50/32</b>

**Table No13.1/4**

**Booster Pump (Centrifugal type)**

Capacity in HP	Speed in RPM	Discharge in LPM	Head in metre	Suction/Delivery Size in mm
<b>7.5</b>	<b>2900</b>	<b>450</b>	<b>35</b>	<b>50/32</b>
<b>10</b>	<b>2900</b>	<b>468</b>	<b>40</b>	<b>50/32</b>

**13.3 Main Fire Pumps (Submersible) (FF- MFP/SBM)**

**13.4 Jockey Pumps (FF-MPF/JP)**

**Specification No**

**1. Main Fire Pumps (FF- MFP/SBM)**

**2. Jockey Pumps (FF- MFP/JP)**

**Scope:**

Supply, installation, testing & commissioning of fire pump (submersible) of required

stages having specified discharge and head with min. HP or equivalent for design parameters. Submersible pump sets shall be manufactured in accordance with IS:

8034 specifications.

Selection of Main Fire Pumps (Submersible type) shall be as per Table No. 13.1/5

**Material:**

**Pump bowls & casings:** Closed grained C.I. coated with special Epoxy resin paint or

high corrosion resistance.

**Impeller:** Made form Gun metal & dynamically balanced for smooth and silent operations.

**Strainer:** Stainless steel

**Bearing Bushes: Lead bronze**

**Bearing sleeves: High quality stainless steel**

**Pump shaft:** High quality stainless steel & dynamically balanced for smooth and silent

operations.

**Motor body:** Cast iron

**Rotor shaft:** High quality stainless steel & dynamically balanced for smooth and silent

operations.

**Stator Housing:** MS Seamless tube.

**Thrust bearing:** Bronze

**Thrust bearing plate:** High quality fiber sheet

**Windings:** PVC insulated copper

### **Method of Construction:**

The provided M.S. frame shall be erected at inclined level at bottom of sump in rigid

manner. The submersible pump shall be erected on this frame & shall be clamped

properly & shall be connected to delivery pipe line with M.S. flanges, gaskets, nutbolts,

water level guard connections, etc. The pump shall be checked for the leakages.

The proper electrical connection shall be made. The pump shall be tested for 3.5 Kg/ cm<sup>2</sup>.



Pressure at highest & furthest point building for minimum 2 hours. The test certificate from

manufacturer of pump and motor shall be submitted. The motor should have efficiency

more than 90% and power factor above 0.80.

**Mode of Measurement:** Executed quantity shall be measured on number basis.

**Table No-13.1/5**

**Fire Fighting pump (Submersible pump)**

Capacity in HP	Speed in RPM	Discharge in LPM	Head in metre	Delivery Size in mm
<b>30/2</b>	<b>2900</b>	<b>1400</b>	<b>56</b>	<b>130</b>
<b>45/3</b>	<b>2900</b>	<b>1800</b>	<b>76</b>	<b>130</b>
<b>75/5</b>	<b>2900</b>	<b>2400</b>	<b>88</b>	
<b>30/2</b>	<b>2900</b>	<b>1800</b>	<b>56</b>	
<b>105/7</b>	<b>2900</b>	<b>2800</b>	<b>105</b>	
<b>60/4</b>	<b>2900</b>	<b>2800</b>	<b>76</b>	

**13.6 Pipes (FF-PP)**

**Pipes**

**Specification No (FF-PP)**

**Scope:**

Supplying erecting C class (Heavy Duty) galvanized iron pipe, ISI mark of specified diameter with screwed sockets, Joints & necessary G.I. fittings such as sockets, check nuts, elbows, bends, tees, reducers, enlarger, plugs, etc. including electric resistance welding (ERW), fixing with clamps & all connected works such as excavation, drilling holes in wall, slabs, backfilling & making good the damages.

**Material:**

The galvanized iron pipes shall be of type and diameter as specified and

shall comply with I.S. 1239--1973 and 1969 for the specified type. The specified diameter of the pipes shall refer to the inside diameter of the bore pipes. The fittings of which the galvanizing has been damaged shall not be used. For the firefighting works, the C Class pipes and accessories shall be used.

***Anti-Corrosive Protection On Under Ground Pipe:***

Corrosion protection tape shall be wrapped on M.S. Pipes to be buried in ground. This corrosion protection tape shall comprise of coat tar/asphalt component supported on fabric of organic or inorganic fiber and minimum 4 mm. thick and conform to requirement of IS: 10221-Code of practice for coating and wrapping of under ground mild steel pipe line. Before application of corrosion

protection tape all foreign matter on pipe shall be removed with the help of wire brush and

suitable primer shall be applied over the pipe thereafter. The primer shall be allowed to dry

until the solvent evaporates and the surface becomes tacky. Both primer and tape shall be

furnished by the same manufacturer. Corrosion protection tape shall then be wound around

the pipe in spiral fashion and bounded completely to the pipe. There shall be

no air pocket or bubble beneath the tape. The overlaps shall be 15 mm. and 250 mm. shall be left uncoated on either end of pipe to permit installation and welding. This area shall be coated and wrapped after the pipe line is installed.

The tapes shall be wrapped in accordance with the manufacturer's recommendations. If application is done in cold weather, the surface of the

pipe shall be pre-heated until it is warm to touch and traces of moisture are removed and then primer shall be applied and allowed to dry.

No joint shall be located in the thickness of the walls.

If the pipe is required to be cut and the end threaded, the burns of the cut end shall be filled smooth and any obstruction in the bore shall be entirely eliminated. The rate includes wastage in cutting etc.

When the pipe is to be fixed to walls it shall be fixed with standard bracket, clips or holder bates keeping the pipe about 12mm clear of the wall. The pipe shall be fixed to the wall horizontally and vertically and parallel to one another when more than one pipe is laid unless unavoidable. The supporting clips, etc., for the pipe shall be spaced at about two meters or so as necessary.

When holes are not left during construction they shall be cut into the walls or slabs, etc., to pass the pipe through or to fix clamps. etc., after fixing of the pipes, clamps etc., these shall be neatly made good.

**Pressure Testing:**

All piping shall be tested to hydrostatic test pressure of at least one and a half times the maximum operating pressure, but not less than 10 kg/cm<sup>2</sup> for a period not less than 24 hours. All leaks and defects in joints revealed during the testing shall be rectified to the satisfaction of the Engineer-in-Charge.

Piping repaired subsequent to the above pressure test shall be re-tested in the same manner.

System may be tested in sections and such sections shall be securely capped.

Pressure gauges may be capped off during pressure testing of the installation.

**Method of Construction:**

Galvanized iron pipes of specified diameter and type and galvanized iron

fittings with ERW shall be erected on MS angle support with one coat of red oxide primer and two coats of Post Office fire red enamel paint duly tested to 1.5 times of working pressure.

Excavating and back filling trenches including dewatering, cutting through walls, floor, etc., and making site good.

Laying, jointing, and fixing the pipe with the fittings including cutting pipes, wastage and threading the ends.

At all the road crossings the pipes shall be laid lower than the crust of the road.

During excavation if, any other service pipes (Water, electric, telephone, etc) come across, these shall be carefully protected and supported. Any damages done shall be made good.

The pipe shall be laid on a well compacted bed in the trench. The trench after laying the pipe shall be refilled except at the joints in layers and manually rammed. Care shall be taken to see that no earth, etc., gets inside the pipes. The filling shall be kept raised by about 5 cm. for subsequent settlement.

Bedding and cushioning of murum, good earth, or sand shall be provided for the pipe in case of trench through rock. The trench at the joints shall be filled similarly after satisfactory testing of the pipe. Any surplus excavated stuff shall be disposed of satisfactorily without causing nuisance.

**Mode of Measurement:**

Measurement shall be for one metre of each type and diameter of pipe laid complete with fittings, clamps etc., as specified.

The lengths shall be measured net on the straight and bends along the center line of the pipes and fittings correct up to a cm.

**13.7 Valves (FF-VL)**

**A) Foot Valve with Strainer (-ve suction)**

**Scope:**

**Specification No (FF- VL/FV)**

Supplying and installing cast iron foot valve of specified diameter with strainer conforming to IS: 4038 with Gun metal seat (flapper), nut bolts, gasket, washers etc.

for negative suction.

**Material:**

**Housing, seat discs and disc plates:** Grey cast iron

**Hinge pins and disc guide:** High tensile Stainless Steel bars

**Strainers:** a) Grey cast iron, b) Galvanized steel

**Disc faces:** a) Vegetable tanned leather (Min. 3 mm. thick), b) Leaded tin bronze, c)

Natural rubber (with reinforcement of cotton canvas), d) Synthetic rubber (with reinforcement of

cotton canvas)

**Flange jointing nature:** a) Compressed fibre board or rubber minimum 1.5 mm

thick. The fibre board shall be impregnated with chemically neutral oil and shall have

a smooth and hard surface. b) Compressed asbestos fibre.

**Method of Construction:**

The footwall with strainer shall be fitted with provided flange, gaskets, nut bolts to be

erected at required position and fitted firmly to pipe with proper alignment so as the

joints should be leak proof with shellac and other material required including

necessary labour and required tools and plants

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**B) End line strainer (+ ve suction)**

**Specification No (FF- VL/ELS)**

**Scope:**

Supplying and installing end liner strainer of specified diameter as per IS: 907, fabricated out of brass perforated sheet of 14 SWG (2.0 mm. thick) duly with brazing to

flange or pipe with nut bolts, gaskets, washers etc, in position for only suction in an approved

manner.

**Material:**

**Body:** Cast Iron

**Strainer screen:** Stainless steel/Brass screen of 1mm thick perforated sheet with 3

mm diameter holes.

**Flange:** Cast iron / M.S. sheet

**Method of Construction:**

End line strainer with strainer shall be fitted with provided flange, gaskets, nut bolts

etc, and to be erected at the end of suction pipe, including labour and required tools

and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**C) Sluice valve**

**Specification No (FF- VL/SV)**

**Scope:**

Supplying and installing cast iron double flange sluice valve of specified diameter

conforming to IS: 780, ISI mark, having cast iron body and gun metal working parts

with nut bolts, gaskets etc. and tested to 1.5 times of working pressure, in an approved

manner.

**Material:**

**Body:** a) Brass, b) Leaded tin bronze

**Bonnet or cover:** a) Leaded tin bronze, b) Forged brass, c) Brass

**Stuffing box, disc hinge, check nut, stem nut, disc retaining nut, gland, gland**

**nut, gland flange, body seat rings and disc or wedge facing rings (where**

**renewable):** a) Leaded tin bronze, b) Extruded brass rod, c) Forged brass, d) Brass

**Stem, hinge pin and plug:** a) Extruded brass rod, b) High-tensile brass, c) Forged

Brass

**Ball (for ball type check valves):** Chromium steel

**Nut bolts:** Mild steel

**Hand wheel:** Cast iron

**Gasket:** Compressed asbestos fibre

**Gland packing:** a) Hemp and jute, b) Asbestos

**Spring:** Phosphor bronze wire

**Seating ring:** Synthetic rubber

**Method of Construction:**

The double flange sluice valve shall be fitted with provided flange, gaskets, Nut bolts,

etc. to be fitted to pipe, accessories with washers, spring washers, check nuts as required

with proper alignment so as to be leak proof including necessary labour and required

tools and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**D) Butterfly valves**

**Specification No (FF- VL/BFV)**

**Scope:**

Supplying & installing cast iron double flange butterfly valve of size 75/80mm.dia

confirming to IS: 13095 having cast iron body, FG 220 Nitrite rubber replaceable seat

with Moulded 'O' ring, C.I. powder coated disc flow control complete & tested to 1.5

times of working pressure in an approved manner.

**Material:**

**Body:** Cast iron Spheroid graphite iron Carbon steel

**Disc:** a) Cast iron Spheroid graphite iron carbon steel, b) Stainless steel Gun metal

c) Aluminum bronze

**Shaft:** a) Stainless steel, b) Carbon steel Aluminum bronze Nickel copper alloy

**Seating ring/Seal retaining ring:** a) Stainless steel, b) Gun metal aluminum bronze

deposited metal suitable for duty or resilient material

**Seat:** Elastomers

**Shaft bearing seals:** Manufacturer's standards suitable for duty

**Internal fastenings:** Stainless steel

**External bolting:** Carbon steel: tensile strength 390 n/mm or MPa

**Method of Construction:**



The double flange butterfly valve shall be fitted with provided flange, gaskets, Nut

bolts etc. to be fitted to pipe, accessories with washers, spring washers, check nuts

as required with proper alignment so as to be leak proof including necessary labour

and required tools and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

.

**E) Non Return Valves**

**Specification No (FF- VL/NRV)**

**Scope:**

Supplying and installing double flange NRV of specified diameter conforming to IS:

5312 (Part-I), ISI mark, having cast iron body and gun metal working parts with nut

bolts, gaskets, etc. and tested to 1.5 times of working pressure in an approved manner.

**Material:**

**Body, cover, door, bearing holder:** Grey cast iron

**Hinge pin, door pin and door suspension pin:** Stainless steel

**Body seat rings:** Leaded tin bronze

**Door face ring:** Leaded tin bronze

**Bearing bushes/ Bearing block:** Leaded tin bronze

**Plugs for hinged pin/Air release plug:** Leaded tin bronze

**Bolts:** Carbon steel

**Nuts:** Carbon steel

**Gaskets:** Rubber

**Hinges:** Grey cast iron

**P N Rating and Test Pressure:**

<b>S No.</b>	<b>PN Rating</b>	<b>Test for</b>	<b>Test Pressure (Gauge) MPa</b>	<b>Test Duration in minutes</b>
<b>1</b>	PN 1.0	Body	1.5	5
		Seat	1.0	2
<b>2</b>	PN 1.6	Body	2.4	5
		Seat	1.6	2

**Method of Construction:**

The double flange NRV shall be fitted to pipe with provided flange, gaskets, and Nut

bolts etc, accessories with washers, spring washers, and check nuts as required with

proper alignment so as to be leak proof including necessary labour and required tools

and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**F) Gate Valves**

**Specification No (FF- VL/GV)**

**Scope:**

Supplying & installing gun metal gate valve of specified diameter having threaded

ends, conforming to IS: 778, ISI mark, along with G.I. threaded nipple.

**Material:**

**Body:** a) Brass, b) Leaded tin bronze

**Bonnet or cover:** a) Leaded tin bronze, b) Forged brass, c) Brass

**Stuffing box, disc hinge, check nut, stem nut, disc retaining nut, gland, gland**

**nut, gland flange, body seat rings and disc or wedge facing rings (where**

**renewable):** a) Leaded tin bronze, b) Extruded brass rod, c) Forged brass, d) Brass

**Stem, hinge pin and plug:** a) Extruded brass rod, b) High-tensile brass, c) Forged

Brass

**Ball (for ball type check valves):** Chromium steel

**Nut bolts:** Mild steel

**Hand wheel:** Cast iron

**Gasket:** Compressed asbestos fibre

**Gland packing:** a) Hemp and jute, b) Asbestos

**Spring:** Phosphor bronze wire

**Seating ring:** Synthetic rubber

**Method of Construction:**

The Gate Valve shall be fitted to pipe with provided flange, gaskets, and Nut bolts etc,

accessories with washers, spring washers, and check nuts as required with proper

alignment so as to be leak proof including necessary labour and required tools and

plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

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## **G) Hydrant Valves (Landing Valves)**

### **Specification No (FF- VL/HV)**

#### **Scope:**

Supplying and installing gun metal single outlet hydrant valve Morris pattern, oblique

type, conforming to IS:5290, ISI mark, with G.M. blanks cap and M.S. or G.I. chain in

an approved manner.

#### **Material:**

**Valve Body, bonnet, stop valve, Check nut, female outlet:** Bronze/ Aluminium

alloy or Stainless Steel

**Valve spindle:** Bronze/ Aluminum alloy or Stainless Steel

**Hand Wheel:** M.S. or C.I. (Black painted)

**Spring:** Made of phosphor wire.

**Washer, Gasket:** Rubber

**Blank Cap:** ABS plastic.

#### **Method of Construction:**

The hydrant valve shall be connected with provided flange, gaskets, Nut bolts etc.

with use of required tools and plants.

The water discharge shall be not less than 900 lpm for single head and 1800 lpm for

double head valves at 7 kg / cm<sup>2</sup>

#### **Mode of Measurement:**

Executed quantity shall be measured on number basis.

.

## **13.8 Fire Fighting Accessories (FF-FFA)**

## **A) Priming Tank**

### **Specification No (FF- FFA/PT)**

#### **Scope:**

Supplying & Installing One piece Moulded HDP / Fibre water tank of required capacity

with necessary plumbing material on provided M.S. structural supports in an approved

manner.

#### **Material:**

**Priming Tank:** HDPE/ Fiber of good quality material

**Gate Valves:** As per (FF- VL/GV) above.

#### **Method of Construction:**

The Priming tank shall be installed on provided M.S. structural supports with 20/25

mm dia. inlet valve and 50 mm dia. outlet valve with provided necessary G.I. piping

up to delivery of main fire pump before non-return valve.

#### **Mode of Measurement:**

Tank capacity will be measured on litre basis. (i.e. per litre)

## **B) Hose Reel**

### **Specification No (FF-FFA/HRD)**

#### **Scope:**

Supplying and installing wall mounting swinging Hose reel drum as per IS: 884 and

fitted with 19 mm dia 22.5 meter long high pressure polypropylene (Polyhose) pipe as

per IS: 444 (type III) G.M. chrome plated nozzle and 19 mm dia and G.M. gate valve

on the inlet pipe with necessary M.S. Bracket for holding Hose reel drum fitted in position

with wall fasteners, in an approved manner.

**Material:**

**Hub and sides:** Aluminum Alloy/Mild steel/ Aluminum sheet

**Wall Bracket:** Cast iron / Mild steel.

**Hose tube (20 mm):** Thermoplastic (Textile Reinforced) Type-2, (Nominal internal

dia) as per IS- 12585

**Nozzle with branch Pipe:** Brass as per IS 8090

**Stop Valve (Ball Valve) :**Gun metal.

**Method of Construction:**

The Wall Mounting swinging Hose reel drum with Gun Metal Nozzle, gate valve, shall

be connected on M.S. bracket with provided flange, gaskets, Nut bolts etc. with use of

required tools and plants. The water flow rate shall be not less than 24 LPM and the

range of jet shall be not less than 6 metre.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

.

**C) Hose pipe for Hose reel**

**Specification No (FF-FFA/HOP)**

**Scope:**

Supplying & erecting high pressure polypropylene hose pipe 20 mm. dia as per IS

444- type III & IS 446-1980 type I fabricated from polyester core braided with high

tensile textile yarn suitable for erection of 19 mm Gun Metal Chrome plated nozzle.

**Material:**

**Hose pipe material:** Polypropylene, the lining and the cover shall be of uniform thickness,

reasonably concentric and free from air blisters, porosity and splits. The tensile strength

shall be minimum 5.00 MPa and shall withstand for 10.2 kg/cm<sup>2</sup>

**Nozzle:** Chrome plated gun metal

**Method of Construction:**

The hose pipe shall be connected with provided couplings.

**Mode of Measurement:**

Executed quantity shall be measured on per meter basis.

**D) Rubber Hose Pipe**

**Specification No (FF-FFA/RHP)**

**Scope:**

Supplying & erecting high pressure rubber hose pipe 20 mm. Dia as per IS 446-1978

(type I) & IS 444- 1978 (type II) fabricated lead moulded with high tensile yarn braided

rubber hose pipe suitable for erection of 19 mm gun metal Chrome plated nozzle.

**Material:**

**Hose pipe material:** Rubber. The lining and the cover shall be of uniform thickness,

reasonably concentric and free from air blisters, porosity, and splits. The tensile shall

be minimum 5.00 MPa and shall withstand pressure of 10.2 kg/cm<sup>2</sup>

**Nozzle:** Chrome plated gun metal

**Method of Construction:**

The hose pipe shall be connected with provided couplings.

**Mode of Measurement:**

Executed quantity shall be measured on per meter basis.

**E) Controlled Percolation Hose Pipe**

**Specification No (FF-FFA/CPH)**

**Scope:**

Supplying fire fighting C P (Controlled Percolation) Hose pipe of 63 mm in diameter,

conforming to IS: 8423, and 15 metre in length, fitted with male and female G.M. coupling

confirming to IS: 903, ISI mark.

**Material:**

**Hose pipe material:** Synthetic cotton yarn confirming to IS 8423 and shall be made of

jacket or cotton or synthetic material or their combination. It shall be tested as specified in IS and

shall withstand for pressure 10.2 kgf/cm<sup>2</sup> and should not burst before a pressure of 35.7 kg/ cm<sup>2</sup>

is reached.

**Coupling:** Gun metal confirming to IS 903

**Method of Construction:**

Hose pipe of 15 metre length with male and female Gun metal coupling shall be connected as per direction.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**F) R.R.L Hose Pipe**

**Specification No (FF-FFA/RRL)**



**Scope:**

Supplying fire fighting R.R.L. Hose pipe, conforming to IS: 636 (Type-A) 15 metre

length, fitted with male and female G.M. coupling confirming to IS: 903, with ISI mark.

**Material:**

**Hose pipe material:** Rubber lined woven jacketed & 63mm in dia., the lining and the

cover shall be of uniform thickness, reasonably concentric and free from air

blisters, porosity and splits. The tensile shall be minimum 5.00 MPa and shall withstand

pressure of 10.2 kg/ cm<sup>2</sup>

**Coupling:** Gun metal

**Method of Construction:**

Hose pipe of 15 metre length with male and female Gun metal coupling shall be connected as per direction.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**G) Canvas Hose Pipe**

**Specification No (FF-FFA/CHP)**

**Scope:**

Supplying fire fighting canvas Hose pipe, conforming to IS: 4927 and 15 metre length,

fitted with male and female G.M. coupling confirming to IS: 903, with ISI mark.

**Material:**

**Hose pipe material:** Canvas

**Coupling:** Gun metal

**Method of Construction:**

Canvas hose pipe 15 metre in length with male and female Gun metal coupling including

necessary labour, material and use of required tools and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**H) Nozzles**

**Specification No (FF-FFA/NZ)**

**Scope:**

Supplying G.M. branch pipe of 63 mm diameter with specified length fitted with 20

mm diameter detachable hexagonal nozzle confirming to Is: 903, ISI mark.

**Material:**

**Nozzle:** Chrome plated Gun metal

**Method of Construction:**

Gun metal hexagonal nozzle fitted with required tools and plants including necessary

labour, material, etc.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**I) Fire Brigade connection**

**Specification No (FF-FFA/FBC)**

**Scope:**

Supplying and installing fire brigade Header of 150 mm Ø, G.I. 'C' class pipe having 2

Nos. of 100 mm 'T' outlet with 100 mm Ø flange, fitted with 2 Nos. of G.M. fire branching

inlet connection, each consisting of 2 Nos. 63 mm dia. G.M. male inlet for supplying

water in fire tank.

**Material:**

**Pipe material:** G.I. 'C' class (Heavy duty)

**Branching Inlet:** Gun metal

**Male Inlet:** Gun metal

**Method of Construction:**

In case under ground storage tank is not approachable by fire tenders, a 4 way 63

mm diameter instantaneous male inlet connection is provided at street level and connected to UG tank with 1 meter length of 150mm. diameter under ground pipe.

The whole unit shall be placed in provided MS box made of 2 mm thick MS sheet with

openable glass cover.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**J) Siamese connection (Fire service Inlet)**

**Specification No (FF-FFA/SMC)**

**Scope:**

Supplying and installing fire brigade Header (Siamese Connection) of 150 mm Ø, G.I.

'C' class pipe having 2 Nos. of 100 mm 'T' outlet with 100 mm Ø flange, fitted with 2

Nos. of G.M. male inlets with spring type NRV for supplying water to Wet riser.

**Material:**

**Pipe material:** G.I. 'C' class

**Branching Inlet:** Gun metal

**Male Inlet:** Gun metal

**Non Return Valve:** As per **(FF- VL/NRV)** above.

**Method of Construction:**

In order to facilitate feeding of water in the system by fire service, a 4 way 63 mm

diameter collecting head shall be provided and connected with each riser/down comer

and the ring main with non return valve and with provided butterfly/slucice valve. This should be

located at a place where fire brigade tender can reach.

The whole unit is placed in provided MS box made of 2 mm thick MS sheet with open-able

glass cover.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**K) Air Cushion Tank (Air Vessel)**

**Specification No (FF-FFA/ACT)**

**Scope:**

Supplying and installing Air Vessel of 300 mm Ø 1.5 mtr. in height M.S. Tank

fabricated from M.S. black ERW pipe, conforming to I.S.: 3589, having 6mm thickness,

dish end at both ends, duly welded with 300 mm Ø pipe, having inlet of 100 mm Ø, duly fitted with

100 mm Ø slucice valve and 20/25 mm Ø draw in with G.M. gate valve, to be installed inside

pump house along with provided M.S. angle

tripod.

**Material:**

**Air Vessel:** MS ERW pipe confirming to IS 3589

**Tripod:** MS angle of size 75 x 75 x 5mm

**Method of Construction:**

300mm dia, 1.5 metre height air vessel, Gate Valve, flanges, MS angle Tripod including

necessary labour, material and use of required tools and plants.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**L) Air Release Valve**

**Specification No (FF-FFA/ARV)**

**Scope:**

Supplying and erecting Air release cock of 20/25 mm Ø made from G.M. with necessary G.I. coupling for fixing on top of Air vessel or on wet riser.

**Material:**

**Air release Valve:** Gun metal

**Coupling:** G.I.

**Method of Construction:**

Air release Valve with necessary GI Coupling shall be fixed on top of wet riser with

required labour, tools, etc.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**M) Pressure Gauge**

**Specification No (FF-FFA/PG)**

**Scope:**

Supplying and installing pressure gauge of 100 mm Ø. 0-300 PSI or 0-21 kg/cm<sup>2</sup> square

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

fitted with 12/15 mm Ø. pad cock valve, and G.I. pipe, elbow etc. as per requirement in an

approved manner.

### **Material:**

**Pressure Gauge:** 100 mm diameter made from Brass metal.

**Cock valve, elbow, and pipe:** G.I

### **Method of Construction:**

The 100 mm dia pressure gauge with G I cock valve, erected with GI Pipe including

accessories, with required labour, tools, etc, as directed by the Engineer-in-charge.

### **Mode of Measurement:**

Executed quantity shall be measured on number basis

## **N) Pressure Switch**

### **Specification No (FF-FFA/PS)**

### **Scope:**

Supplying and installing pressure switch with 12/15 mm Ø isolation valve, G.I. nipple,

elbow etc. in an approved manner.

### **Material:**

**Pressure switch:** Brass metal

**Isolation valve, elbow, Nipple:** G.I

### **Method of Construction:**

The Pressure switch with G I isolation valve, and necessary GI fittings (elbow, Nipple)

fitted with required labour, tools, etc.

### **Mode of Measurement:**

Executed quantity shall be measured on number basis

**O) Orifice plate**

**Specification No (FF-FFA/OP)**

**Scope:**

Supplying and erecting one no. Brass orifice plate having 6 mm. thick with specified

outer diameter and suitable inner diameter to reduce the pressure between

3.2 kg/cm<sup>2</sup> to 5.5 kg/cm<sup>2</sup>

**Material:**

**Body:** Stainless steel 6 mm thick

**Method of Construction:**

The Orifice plate shall be placed before the hydrant valve.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**13.9 Fire Alarm System (FF-FAS)**

**A) Heat detector**

**Specification No (FF-FAS-HD)**

**Scope:**

Supplying, erecting, and testing heat detector with base erected on 16 gauges M.S.

sheet box of 100 x 100 x75 mm size duly painted.

**Material:**

**Heat detector:** UL listed / LPCB marked with 360° blinking LED & having 68° C/78° C

fixed temperature.

**Box:** CRCA/MS sheet of 16 gauges

**Red oxide paint:** Superior quality

**Enamel paint:** Superior quality of specified colour

**Hardware:** Sheet metal screws

**Plugs:** Plastic

**Method of Construction:**

The Heat Detector shall be fixed on the CRCA/MS sheet box duly painted with one

coat of red oxide & 2 coats of enamel paint of specified shade with necessary SM screws, plugs, etc on ceiling, duly terminating the provided cable with provided glands

and making the connection.

**Mode of measurement:**

Executed quantity shall be measured on number basis

**B) Optical type Photo electric smoke detector**

**Specification No (FF-FAS/SD)**

**Scope:**

Supplying, erecting and testing optical type smoke detector complete with base erected

on 16 gauge CRCA/MS sheet box of 100 x 100 x 75 mm duly painted.

**Material:**

**Smoke detector:** UL listed / LPCB marked

**Box:** CRCA/MS sheet of 16 gauge

**Red oxide paint:** Superior quality

**Enamel paint:** Superior quality of specified colour



**Hardware:** Sheet metal screws

**Plugs:** Plastic

**Method of Construction:**

The Smoke Detector shall be fixed on the CRCA/MS sheet box duly painted with one

coat of red oxide & 2 coats of enamel paint of specified shade with necessary SM screws, plugs, etc on ceiling, duly terminating the provided cable with provided glands

and making the connection.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**C) Beam type Photo-Thermal/Thermal Smoke detector (Optical Beam Detector)**

**Specification No (FF-FAS/OBSD)**

**Scope:**

Supplying, erecting and testing Optical Beam Detector (Beam type Photo-Thermal

Smoke detector) complete with Transmitter and receiver unit erected on wall/ceiling

with base.

**Material:**

**Detector:** Comprising Transmitter & Receiver unit, UL listed / LPCB marked, with BS

5839 part 1 2002, compliance and duly tested & certified as per EN54-12: 2002.

The detector shall have following features:

- Automatic drift compensation
- Dust tolerance chamber to provide optimum detection performance and minimal

nuisance alarms to minimize maintenance

- Digital addressing capability
- Photoelectric and Photo-thermal multi criteria
- Operating voltage range 8 to 30 V DC
- Operating temperature range -30 to +70°C
- Multi-function Alarm- Normal bi-colour LED indicator.

**Hardware:** Sheet metal screws

**Plugs:** Plastic

**Applications:**

- Photo-Thermal detector to be used in General purpose halls, auditoriums, and at

spaces where the ceiling **height is more than** 4.0 metre.

- Thermal detector with combination of fixed and rate of rise heat shall be used in

kitchens, pantry and bars and at similar spaces where the ceiling **height is more**

**than** 4.0 metre.

**Method of Construction:**

The Detector consisting of Transmitter (Detector) and receiver shall be mounted /

fixed at designated place duly connected with provided cable/wires and tested.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**13.10 Fire Alarm Accessories (FF-FAAS)**

**A) Pill Box (Manual Call Point [MCP])**

**Specification No (FF-FAAS/MCP)**

**Scope:**

Supplying, erecting, testing, and commissioning pill box with break glass, push button.

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

MCP is manually operated device used to initiate an alarm signal

### **Material:**

**Push Button:** Plastic

**Enclosure:** CRCA/MS with 100/150 mm round/square with Glass cover

**Hammer with chain:** Brass

**Enamel paint:** Superior quality Post Office red colour

**Hardware:** S.M. Screw

**Plugs:** Plastic

### **Method of Construction:**

The pill box with break glass cover, push button in circular/ square enclosure with

push button kept inside per set with a glass outside marked "IN CASE OF FIRE BREAK

GLASS" provided with a small hammer and chain fixed to the pill box shall be mounted on wall

or any other place as directed and provided with cable entry with suitable terminal inside and

painted with two coats of red oxide and two coats of post office red enamel paint.

### **Mode of Measurement:**

Executed quantity shall be measured on number basis

## **B) Hooter**

### **Specification No (FF-FAAS/HTR)**

#### **Scope:**

Supply and erecting hooters with CRCA enclosure duly connected to main amplifier to

radiate two tone sounds for public.

### **Material:**

**Hooter:** Electronic type with 6W output, Line matching transformer

**Enclosure:** CRCA sheet of 14 SWG with perforation

**Enamel paint:** Superior quality Post Office red colour

**Hardware:** S.M. Screw

**Plugs:** Plastic

**Gitties:** Wooden

**Method of Construction:**

The electronics hooter with Line matching transformer shall be enclosed in suitable

size perforated CRCA enclosure and installed as per instructions and shall be

connected and fixed at suitable site to ensure that the alarm is heard anywhere in the

protected area. The minimum sound level shall be 80 dB.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**C) Remote Response Indicators**

**Specification No (FF-FAAS/RRI)**

**Scope:**

Supplying, erecting, and testing of remote response indicators.

**Application: Remote Response Indicators shall be fixed for closed rooms,**

**cabins, or for inaccessible rooms, etc.**

**Material:**

**Indicator:** 5 mm LED (2 Nos) / 10 mm LED (1 No) in Red colour

**Enclosure:** CRCA sheet of 14 SWG with perforation

**Enamel paint:** Superior quality of specified colour

**Hardware:** S.M. Screws

**Plugs:** Plastic

**Gitties:** Wooden

**Method of Construction:**

Remote response indicator housed in enclosure shall be fitted outside the rooms,

cabins at accessible height and shall be clearly visible.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**D) Fire Alarm Control Panel**

**Local Control Panel**

**Specification Nos**

**Fire Alarm Control Panel (FF-FAAS/FACP)**

**Local Control Panel (FF-FAS/LCP)**

**Scope:**

Supplying, erecting, testing, & commissioning of Fire Alarm Control Panel with all accessories.

**Material:**

**Panel:** Microprocessor based Conventional Main Fire Alarm Control Panel (FACP) with necessary Test Certificate from ERTL as per IS 2189-1999 provided with SMPS

(Switch Mode Power Supply) of suitable battery (2x12V) 24V, 24 AH capacity maintenance free battery as standby supply to switch over automatically for a period of

8 hours in case of A.C. supply failure to panel with 7 AH capacity battery charger,

panel shall have following features.

- a) Visual zone indication in which fire has emerged.
- b) Audio alarm devices.

- c) Acknowledge reset and test devices.
- d) Visual indication (2x20 character LCD display) incorporating following indications:
  - (i) Fire condition
  - (ii) Fault condition
  - (iii) A.C. Pilot indication
  - (iv) Low battery indication
  - (v) Blown fuse indication A.C. as well as D.C.
  - (vi) Built in electronic hooters of 2 tone round for fire condition and single tone for fault condition.
  - (vii) Open and short circuit fault.
  - (viii) Push button switch for checking each zone.
  - (ix) Push button to disable audio alarm.
  - (x) Reset push button.
- e) Fire protection and alarm circuit shall have modular design using electronic plug in type printed circuit boards (PCB) with spare cards.

**Method of installation:**

The microprocessor based main fire Alarm control panel designed as per IS 2189-

1999 with ERTL Test certificate shall be fixed at accessible place so that security or

fire personal can attend to the fault immediately.

**Testing:**

The control shall be tested for following features:

- 1) Alarm cancel Test
- 2) Reset 1 lamp
- 3) Fire Test
- 4) Open Test (for detector & hooter)

5) Short circuit Test (for detector & hooter)

6) Walk Test(one man test)

7) Sounder Test

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**13.11 P.A. System (FF-PA/AFR)**

**A) Amplifier for P A System**

**Specification No (FF-PA/AFR)**

**Scope:**

Supplying, erecting, testing, and commissioning amplifier 120 W / 250W for Public

address system.

**Material:**

**Amplifier:** Amplifier unit with wall mounted closed cabinet having rated output wattage

120 W / 250W with 4 Nos input channels (2 Nos for Microphone & 2 Nos Auxiliary), 4/8/16 Output

lines, suitable to work on 230 V AC supply / 12 V DC supply, and necessary protection circuit.

**Method of Construction:**

Amplifier unit shall be installed as per guide lines of manufacture and shall be tested

for rated output.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**B) Sound Column**

**Specification No (FF-PA/SOC)**

**Scope:**

Supplying, erecting, testing, and commissioning 15 watts Sound Column.

**Material:**

**Sound Column:** Wall mounted Sound column shall give 15 watts output, with necessary fixing arrangement.

**Method of Construction:**

Sound column shall be installed as per guide lines of and connected to the amplifier

duly tested.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**C) Microphone**

**Specification No (FF-PA/MIC)**

**Scope:**

Supplying, erecting, testing, and commissioning hand shield microphone

**Material:**

**Microphone:** Microphone unit as per manufacturer's standard specifications.

**Method of Construction:**

Microphone unit shall be connected with cord to amplifier unit as per guide lines of

manufacture and shall be tested.

**Mode of Measurement:**

Executed quantity shall be measured on number basis

**D) Microphone Cable**

**Specification No (FF-PA/MCC)**

**Scope:**

Supplying erecting, testing to 2 core shielded Microphone cable.



**Material:**

**Microphone cable:** 2 core microphone cable, PVC insulated with copper conductor.

**Method of Construction:**

Microphone cable shall be connected to microphone and tested.

**Mode of Measurement:**

Executed quantity shall be measured on meter basis

**13.12 Sprinklers (FF-SPR)**

**A) Sprinklers**

**Specification No (FF-SPR)**

**Scope:**

Supplying and erecting 15 mm (1/2") dia. NBCM Body chrome finished, pendent type

quartzoid bulb sprinkler.

**Material:**

Chrome plated sprinkler bulb having 68° / 78°C fixed temperature rating UL listed.

**Method of Construction:**

The sprinklers bulb shall be fitted to sprinklers pipe line and tested for required pressure.

**Mode of Measurement:**

Executed quantity shall be measured on number basis.

**CIVIL WORK**

**17.1 Excavation CW-EXN**

**17.2 Masonry work No Specs**

**17.3 C.C. Foundation No Specs**

**17.4 Painting CW-PTG**

## **17.5 Plumbing CW-PLB**

## **17.6 Plumbing Accessories No Specs**

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### **Chapter 17 Civil Work (CW)**

#### **17.1 Excavation (EXN)**

##### **A) Cable Trench (CTR)**

###### **1. General**

This part of specification deals with the preparation of trenches in soft soil, hard murum, BT

road, and laying of cables inside the trench, etc as per IS: 1255.

###### **2. Scope:**

###### **Specification No (CW-EXN/CTR)**

Excavating in all types of soil strata and making trench for laying cable/cables, providing

sand bed for laying the cable, covering cable with specified material as per requirement,

and finishing the same by making the surface proper with crown on top of the trench.

The following list shows Indian Standards, which are acceptable as good practice, and

accepted standards.

SP 30: 1984 : National Electrical Code

SP 7 (Group 4): 2005 : National Building Code

IS 1255: 1967 : Code of practice of Installation & Maintenance of armoured cables up to 33 kV.

###### **3. Material:**

**Bricks:** Solid Clay bricks of minimum size 225x110x62.5 mm (L x B x H), burnt in the

kiln, of good quality.

**Sand:** Screened sand of good quality.

#### **4. Method of Construction:**

##### **Trench in Soft soil / Hard Murum / Tar road: Single run of cable**

Before excavating the soil for preparing trench, route of cable laying shall be got finalized

from the site in-charge. Trench of minimum 300 mm width shall be excavated up to

minimum depth below the ground surface as per Table No 17.1/1 Bottom of the trench

should be carefully levelled and freed from stones. Cable duly straightened shall be laid flat

and embedded in the 200 mm layer of screened sand at the bottom of the trench. Bricks

shall be laid all over the run of cable as specified below:

Lengthwise for cable up to and including 10 Sqmm of all cores.

Width wise for cable above 10 Sqmm of all cores.

Remaining portion of the trench shall be back filled with the excavated material after

removing stones and sharp / hard material, and making the surface proper. Crown of 150

mm shall be provided over the trench. The remaining excavated material shall be removed

from site and dumped in scrap yard of Local authorities or at suitable place.

##### **Trench in Soft soil / Hard Murum / Tar road: Two or more cables run of cable**

Before excavating the soil for preparing trench, route of cable laying shall be got finalized

from the site in-charge. Trench of minimum required width more than 300mm. shall be

excavated up to minimum depth as per Table No 5, below the ground surface. Bottom of

the trench should be carefully levelled and freed from stones. Cables duly straightened

shall be laid flat and embedded in the 200 mm layer of screened sand. The inter-axial

distance between two cables shall be between 230 and 400 mm. at the bottom of the

trench. Bricks shall be laid all over the run of cable as specified below:

Lengthwise for cable up to and including 10 Sqmm of all cores.

Width wise for cable above 10 Sqmm of all cores.

Remaining portion of the trench shall be back filled with the excavated material after

removing stones and sharp / hard material, and making the surface proper. Crown of 150

mm shall be provided over the trench. The remaining excavated material shall be removed

from site and dumped in scrap yard of Local authorities or at suitable place.

**Trench in Soft soil/Hard Murum/Tar road with half round Hume pipe:**

***(For cables of size 25 Sqmm. and above shall be covered by min. 150 mm. dia.***

***of RCC Hume pipe)***

Before excavating the soil for preparing trench, route of cable laying shall be got finalized

from the site in-charge. Trench of minimum required width more than 300mm. shall be

excavated up to minimum depth as per Table No 5, below the ground surface. Bottom of

the trench should be carefully levelled and freed from stones. Cables duly straightened

shall be laid flat and embedded in the 200 mm layer of screened sand. The inter-axial

distance between two cables shall be between 230 and 400 mm. at the bottom of the

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

trench. Inverted 150mm. dia. Half round RCC Hume pipe shall be laid above full length of

cable. For more than one cable higher size or more number of Hume pipes are to be

provided.

Remaining portion of the trench shall be back filled with the excavated material after

removing stones and sharp / hard material, and making the surface proper. Crown of 150

mm shall be provided over the trench. The remaining excavated material shall be removed

from site and dumped in scrap yard of Local authorities or at suitable place.

As per 3.1 above, in place of bricks, the cable of size 25 sq.mm and above shall be

covered with 150 mm dia. half round Hume pipe.

### **4.4 Mode of Measurement:**

Executed quantity shall be measured on the basis of running meter per run of cable.

### **Table No 17.1/1**

#### **Minimum laying Depth of cables (IS: 1255)**

S.No	Voltage level of cables	Minimum depth from top of the cable
1	Up to 1.1 kV	750 mm
2	3.3 kV to 11 kV	900 mm
3	22 kV to 33 kV	1050 mm
4	At road crossing	1000 mm
5	At railway crossing (from Bottom of sleepers to Top of pipe)	1000 mm

### **17.4 Painting (PTG)**

#### **General:**

This part of specification deals with the painting of all types of Fans, Poles, Fluorescent

fittings, Panel type lift doors, Collapsible gates of lift, Transformer, Fencing & Gate of

transformer sub station, Feeder pillar, etc.

### **A) Painting of Fans (PTF)**

#### **Specification No (CW-PTG/PTF)**

##### **Scope:**

Spray painting of table fan / pedestal fan / cabin fan / ceiling fan / exhaust fan including

guards etc., shall be carried out in the workshop by adopting following method:

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##### **Method of construction:**

a) Existing paint on the surface of the fan body and its accessories shall first be scrapped off

with the help of Emery paper of required grade or by heating the surface with blowlamp.

One coat of primer shall then be uniformly applied with spraying gun and same shall be

allowed to dry out. The body of fan then shall be spray painted with 2 coats of enamel paint

of specified colour. When the colour is completely dried, rubbing Wax compound shall be

applied. With a smooth cloth, the surface shall then be vigorously rubbed, until the painted

parts starts shining. Same method shall be adopted for fan blades, base & stand of

pedestal fan, mounting frame of exhaust fan. After complete drying, fan shall be covered in

paper, to avoid abrasion.

b) Grills of the fan shall be soaked and then cleaned with solvent and pressure dried. Paint

shall be applied either by brush or with by spraying. After complete drying, it shall be

covered in paper, to avoid abrasion.

c) The agency shall have to make arrangement of transportation of fans from site to workshop

& back to site, after completion of painting job.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

## **B) Painting of Poles/Channels (PTP)**

### **Specification No (CW-PTG/PTP)**

#### **Scope:**

Painting of channel / steel tubular / Rail / RSJ / pipe pole along with street light / pole

brackets / clamps completely & providing one coat of red oxide paint and two coats of

aluminum paint (Black paint up to 1.5 m from plinth is recommended)

#### **Method of construction:**

a) Existing paint of the pole/channel shall be scrapped completely by emery paper/wire brush.

Then one coat of red oxide shall be applied on cleaned surface. After drying out of the red

oxide two coats of aluminium paint shall be uniformly applied to the pole/channel. In case of

pole, it is recommended to apply black paint for the portion, which shall get embedded in

soil/foundation. Remaining portion of the pole shall then be painted with two coats of

aluminium paint as per instruction.

b) The agency shall make arrangement of ladders, tools, spares, etc. required for carrying out

painting at site.

**Mode of Measurement:** Executed quantity shall be measured on running meter basis. (i.e per meter)

**C) Painting of Fluorescent fittings (PFT)**

**Specification No (CW-PTG/PFT)**

**Scope:**

Spray painting of fluorescent fitting with flat reflector for ½ - 4' FTL completely from inside

and outside after dismantling inside wiring / accessories and providing one coat of red

oxide and two coats of best quality enamel paint of required colour and duly wired with

accessories complete with re-erection as original.

**Method of construction:**

a) Fitting shall be dismantled from its location. All wiring shall then be dismantled and stored

in safe place, so as to reuse it after the painting.

b) Existing paint of the metal surface of both the surfaces (inside & outside) shall be scrapped

completely by using emery paper. After cleaning the scrapped surface, one coat of red

oxide shall be applied by spraying gun. When the red oxide is completely dried out, two

coats of white or any other specified colour shall be uniformly applied with spraying gun.

c) The fitting duly painted then shall be erected at its location with necessary required

hardware.

d) The agency shall make necessary arrangements of tools/ladders required for executing the

above job.



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**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**D) Painting of Panel type doors of Lift (PLD1)**

**Specification No (CW-PTG/PLD1)**

**Scope:**

Spray Painting of Panel type lift doors of MS, complete with scrapping the existing paint

preparing the surface, painting the door with one coat of red oxide paint, white primer and

finally with two coats of best quality paint of colour specified by engineer in-charge &

polishing with rubbing compound & final polish of surface painting of doors etc.

**Method of construction:**

a) Existing paint on the surface of the door and its accessories shall first be scrapped off

with the help of Emery paper of required grade or by heating the surface with blowlamp.

b) One coat of primer shall then be uniformly applied with spraying gun and same shall

be allowed to dry out. Then all parts shall be spray painted with 2 coats of enamel

paint of specified colour. When the colour is completely dried, rubbing Wax compound shall

be applied. With a smooth cloth, the surface shall then be vigorously rubbed, until the

painted parts starts shining.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**E) Painting of lift door of Collapsible type (PLD2)**

**Specification No (CW-PTG/PLD2)**

**Scope:**

Painting lift door of collapsible type complete by scrapping the existing paint & preparing

the surface, applying one coat of red oxide, white primer & two coats of approved quality

enamel paint of required colour.

**Method of construction:**

Existing paint collapsible door of lift shall be scrapped completely by emery paper/wire

brush. Then one coat of red oxide shall be applied on cleaned surface. After drying out of

the red oxide, two coats of best quality paint of colour specified by engineer in-charge shall

be uniformly applied to the door.

**Mode of Measurement:** Executed quantity shall be counted on number basis. (i.e.

each)

**F) Spray painting of Distribution Transformer (PDT)**

**Specification No (CW-PTG/PDT)**

**Scope:**

Spray painting of distribution transformer of specified capacity with one coat of red oxide &

two coats of approved quality enamel paint after scrapping the existing paint without any

damages, in an approved manner as per direction.

**Method of construction:**

Existing paint of the transformer body, radiator fins, conservator tank, along with cable end

boxes if any, shall be scrapped with emery paper of required grade. Sufficient care shall be

taken while scrapping the paint at joints, so as to avoid leakage of oil. All the oil stains shall

be removed. After preparing the surface, one coat of red oxide shall be applied with spray

gun. After drying out of red oxide two coats of superior quality paint shall then be uniformly

applied as instructed by site in charge.

**Mode of Measurement:** Executed quantity shall be measured on job basis. (i.e. job)

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(Reciprocating) or discharge cooled (Rotary) compressor with suitable rated capacitor start

electric motor. It should start unloaded and shall be equipped with overload protection. The

compressor shall be mounted on resilient mountings for quiet operation. The compressor

shall conform to IS.10617 (part-1): 1983 with amendment 1 & 2.

<p><b>APPROVED LIST OF MATERIALS FOR ELCETRICAL &amp; AIR CONDITIONERS SYSTEM:</b></p>
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Sr. No.	Items	Make
01	<b>Modular Switch / Socket / MS Boxes</b>	<b>Legrand / Schneider / Wipro/Anchor Roma</b>
02	<b>PVC Conduit &amp; Accessories</b>	<b>Precision / Polycab / Diamond</b>
03	<b>MCCB / MCB / RCCB / ELCB / RCBO</b>	<b>Schneider / L&amp;T / Legrand</b>

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<b>04</b>	<b>Distribution Boards</b>	<b>Schneider / Legrand / L&amp;T</b>
<b>05</b>	<b>Panels</b>	<b>Sk Electrical/RR Control</b>
<b>06</b>	<b>Earthing Material</b>	<b>Fast Earthing / U-Protect</b>
<b>07</b>	<b>LT Cables / Wires</b>	<b>Polycab / Finolex / KEI</b>
<b>08</b>	<b>Cable Glands &amp; Lugs</b>	<b>Dowells / Braco / Comet</b>
<b>09</b>	<b>Cable Tray</b>	<b>Standard</b>
<b>10</b>	<b>Luminaries</b>	<b>Philips / Wipro / Havells</b>
<b>11</b>	<b>Ceiling / Exhaust Fan</b>	<b>Crompton / Bajaj / Havells</b>
<b>12</b>	<b>Street Light Pole</b>	<b>Bajaj</b>
<b>13</b>	<b>Hi-wall splits / Cassette</b>	<b>Daikin / Voltas / Blue Star /Mitsubishi</b>
<b>14</b>	<b>Insulation</b>	<b>Armflex / Gulfoflex</b>
<b>15</b>	<b>Copper Pipes</b>	<b>MET / OHTC / Mandev</b>
<b>16</b>	<b>PVC Pipe (20 kg Density)</b>	<b>POLY PACK</b>

<b>APPROVED LIST OF MATERIALS FOR FIRE FIGHTING SYSTEM:</b>		
<b>1</b>	<b>Pumps</b>	<b>Kirloskar/Lubi/Crompton Greaves</b>
<b>2</b>	<b>Motors</b>	<b>Kirloskar / Siemens</b>
<b>3</b>	<b>Diesel Engine</b>	<b>Kirloskar/Lubi/Crompton Greaves</b>
<b>4</b>	<b>Pipes</b>	<b>Tata/Jindal/Hisar</b>
<b>5</b>	<b>Valves / NRV</b>	<b>L&amp;T / Normex/C&amp;R</b>
<b>6</b>	<b>Alarm Gong</b>	<b>HD / Tyco</b>
<b>7</b>	<b>QB. Sprinkler</b>	<b>Tyco/HD</b>
<b>8</b>	<b>Cable</b>	<b>Polycab / Finolex</b>
<b>9</b>	<b>Wrapping and coating</b>	<b>Pypecoat</b>
<b>10</b>	<b>Hydrant valve/Hose drum/branch pipe / nozzles</b>	<b>Safex /Shah Bhogilal/ Newage</b>
<b>11</b>	<b>Hose</b>	<b>Safex /Shah Bhogilal/ Newage</b>
<b>12</b>	<b>Fire extinguishers</b>	<b>Minimax / Safex</b>
<b>13</b>	<b>Fire brigade connection</b>	<b>Newage /Shah Bhogilal</b>
<b>14</b>	<b>Fire Alarm Control Panel</b>	<b>Honeywell/Apollo/Ravel</b>
<b>15</b>	<b>Detectors</b>	<b>Honeywell/Apollo/Ravel</b>
<b>16</b>	<b>MCP / Hooters</b>	<b>Honeywell/Apollo/Ravel</b>

## **QUALITY ASSURANCE OF WORKS**

### **1. General**

The Quality is a major requirement of the work. The Quality Assurance plan includes strict conformance to the specifications of the materials and workmanship.

The contractor shall ensure availability of adequately manned and equipped manpower for overseeing the quality aspects, availability of field testing instruments and equipments at site and get the laboratory and field tests as per the requirements of mandatory tests mentioned below.

### **2. Instruments, Equipments and Field Lab to be Established by the Contractor at site**

#### **2.1 Field Testing Instruments**

1. Steel tapes - 3 m: 4 Nos.
2. Vernier callipers – 2 Nos
3. Micrometer screw 25 mm gauge
4. A good quality plumb bob
5. Spirit level, minimum 30 cms long with 3 bubbles for horizontal vertical
6. Wire gauge (circular type) disc
7. Foot rule
8. Long nylon thread
9. Rebound hammer for testing concrete
- 10 Dynamic penetrometer
11. Magnifying glass
12. Screw driver 30 cms long
13. Ball pin hammer, 100 gms
14. Plastic bags for taking samples

#### **2.2 List of Equipments**

1. Balances
  - (i) 7 kg. to 10 kg. capacity, semi-self indicating type - accuracy 10 gm.
  - (ii) 500 gm. capacity, semi-self indicating type - accuracy 1 gm.
  - (iii) Pan balance- 5 kg. capacity - accuracy 10 gms.
2. Ovens-electrically operated, thermostatically controlled upto 110°C - sensitivity 1°C.
3. Sieves: as per IS 460-1962.

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- (i) I.S. sieves - 450mm internal dia, of sizes 100 mm, 80 mm, 63mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 6.3 mm, 4.75mm, complete with lid and pan.
  - (ii) I.S. sieves- 200mm internal dia (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns, with lid and pan.
4. Sieve shaker capable of 200 mm and 300 mm dia sieves, manually operated with timing switch assembly.
  5. Equipment for slump test- Slump cone, steel plate, tamping rod, steel scale, scoop.
  6. Dial gauges, 25 mm travel - 0.01 mm/division least count - 2nos.
  7. 100 tonnes compression testing machine, electrical-cum manually operated.
  8. Graduated measuring cylinders 200 ml capacity - 3 Nos.
  9. Enamel trays (for efflorescence test for bricks).
    - (i) 300 mm × 250 mm × 40 mm- 2 nos.
    - (ii) Circular plates of 250 mm dia - 4 nos.

The list of equipments is summarised in the following;

### 2.3 List of equipments required for site laboratory

The contractor shall establish site laboratory. In case, he fails to establish field/site laboratory, an amount of Rs. 20 lakhs shall be recovered from his First RA Bill and released only Rs 15 lakhs after establishment of the laboratory and balance Rs 5 lakhs shall be forfeited apart from the action of forfeiture of security deposit.

#### I. Aggregate Testing

Item	Quantity
1. Aggregate Testing	1. STANDARD SIEVES (INDIAN STANDARD)
	(a) Set of coarse sieves 30 cm dia (GI sheet frames) with aperture size. (40 mm, 25 mm, 20 mm, 16 mm, 17.5 mm, 10 mm, 4.75 mm all with lid and pan)
	(a-1) Motorised sieve shaker for the above sieves 1 No.
	(b) Set of fine sieves 20 cm dia of brass with aperture size (4.75 mm, 2.36 mm, 1.18 mm, 600 mic, 300 mic, 150 mic, 75 mic all with lid and Pan)

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	(b-1) Motorised sieve shaker for the above sieves.	1 No.
2. Flakiness & Elongation index screen		1 No.
3. Riffle sample divider slot width 25mm		1 No.
4. 1 Los Angeles abrasion Testing Machine		1 No.
5. Bulk Density and voids of Aggregates cylindrical metal measures with capacity (3 ltr, 10 ltr, 15 ltr or 20 ltr)		1 No. each
6. Density basket of galvanized wire height 20 cm		1 No.
7. Pycrometer 1000 ml capacity with Brass 1 No.		1 No.
8. Hot – Air Blower (Hair Dryer)		1 No.
9. Aggregate impact value apparatus with automatic blow counter		
10. Hot – plate 1000 to 2000 wells with regulator cum switch		1 No.
11. Drying pans (Frying pans)		2 Nos.
12. China clay dishes with dia 10 cm & 15 cm		2 Nos. Each
13. Watch glasses for above 10 cm & 15 cm		2 Nos. each

**II. Concrete Testing**

1. Sieve Brushes	2 Nos.
2. Concrete cube moulds 15x15x15cm	1 set of 12 Nos. minimum or as required by Engineer in charge
3.. Ultrasonic Test Equipment	1 No.



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4. Pruning Rods 2 Kg weight length 40 cm and ramming face 25 mm <sup>2</sup>	4 Nos.
5. Extra Bottom plates for 15 cm cube mould	6 Nos.
6. Standard Vibration Table for gauging the cubes	2 Nos.
7. Compression Testing Machine with Electricity cum manually operated tamping unit with pressure gauge preferable 30 cm dia, 0-150 tonne in 1 tonne divisions. Sensitivity 0.5 tonne.	1 No.
8. 1 Air content measuring apparatus	1 No.
9. Slump test Apparatus complete	3 Nos. or as required by Engineer in charge
10. Pocket concrete penetrometer 0 to 50kg/sq.cm	1 No.
11. Baby Mixer Machine	1 No.
12. G.I. Tray approx 1mx1m with sides 10 cm high for hand mixing of concrete	2 Nos.
13. Concrete temperature measuring thermometer with Brass protection sheath 0-100 degree centigrade	2 Nos.

**III. Cement Testing**

1. Mortar Cube Moulds 7.07x7.07x7.07 cm 10 Nos.	2 sets, 12 Nos
2. Standard sand Grade I,II,III	50 kgs. each
3. Mortar Cube vibrator	2 No.
4. Vicate needle apparatus Computer	1 No.
5. Blaine's Apparatus	1 No.

**IV. Weighing Equipment**

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1. Physical Balance Capacity 200 gms with weight pony	2 No.
2. Dial type spring balance preferable with zero correction, knob capacity 100 kgs reading to ½ kg	2 Nos.
3. Counter scale capacity 1 kg and 10 kg	1 No. each
4. Weighing platform capacity 100 kg	1 No.
5. Iron Weight of 5 kg, 2 kg, 1 kg, 500 gm, 200 gm, 100 gm	2 Nos. Each
6. Brass Weight of 50 gm, 20 gm, 10 gm, 5 gm, 2 gm, 1 gm	1 Nos. Each

**V. Water Measuring**

5 litres, 2 litres, 1 litre, ½ litre	5 Nos. each
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**VI. Glass and Plastic ware**

1. 5 litres, 2 litres, 1 litre, ½ litre	5 Nos. each
1. Measuring cylinder TPX or Poly propylene capacity 100 ml, 500 ml, 200ml, 100ml	2 Nos. each
2. Pyrex, corning or Borosil beakers with cover capacity 500 ml, 200 ml, 50ml	2 Nos. each
3. Wash Bottles capacity 500 ml	2 Nos. each
4. Thermometers 1-100 degree centigrades/ max. and Min/ Dry and wet with table	1 No.

**VII. Laboratory Tools**

1. Set of box spanner ratchet	2 Nos.
2. Hammer 1lb	2 Nos.
3. Rubber Hammer	2 Nos.
4. Hacksaw with 6 blades	1 No.
5. Measuring tape 2 mtr	2 Nos.
6. Depth gauge 20cm	2 Nos.
7. Steel Foot Plate	2 Nos.
8. Vernier Callipers	2 Nos.

**VIII. Miscellaneous Items**

1. Trowels made from saw blade, 3 mm thick 16x10cm wooden handle	6 Nos.
2. Showels & Spade	6 Nos.

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3. Steel plates 5 mm thick 75x75 cm	2 Nos.
4. Plastic or G.I. Buckets 15 ltr, 10 ltr, 5 ltr	2 Nos.
5. Wheel Barrow	3 Nos.
6. Floor Brushes, hair dusters, scrappers, wire brush, paint brushes, shutter steel plat oil, kerosene with stove etc.	3 Nos.

**3. Design Mix/Ready Mix Concrete (RMC)**

Design mix/RMC and its ingredients shall be in conformity to the requirements of IS456. In case Flyash is allowed in RMC by the Engineer in Charge, flyash shall conform to IS 3812 (Part 1 &2) and duly certified. To ensure uniform blending of flyash with OPC in the plant in conformity with IS 456, a specific facility needs to be created at site with complete computerised automatic process control to achieve design quality or with similar facility with RMC plants. Suitable storage spaces for dry flyash shall be provided. While using PPC in structural concreting works, no further admixing of flyash shall be permitted.

**3.1 Sampling of Concrete**

After the truck mixer has re-mixed its delivery on site, allow at least the first one-third of a cum of concrete to be discharged prior to taking any samples. Take at least 4 incremental samples from the remainder of the load avoiding sampling the last cubic metre of concrete. Thoroughly re-mix this composite sample either on a mixing tray or in the sampling bucket and proceed with the required testing.

**Concrete Mix Information to be supplied by the purchaser**

RMC : .....

Contractor : .....

Site : .....

Mix Code	
Grade (N/mm <sup>2</sup> )	
(Characteristic strength)	
Minimum Cement Content (kg/m <sup>3</sup> )	
Mineral Additives (Pulverized fuel ash/Slag/Others) in kg/cum	
Maximum Free water Cement Ratio	
Nominal Maximum Aggregate size	
Cement Type and Grade (if preferred)	
Target workability (Slump) (mm)	
Target workability at site	
Maximum Temperature of Concrete at the time of placing	
Class of sulphate Resistance (if applicable)	

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Exposure condition (if applicable)	
Class of finish (if applicable)	
Mix Application	
Method of Placing	
Any other requirements (early strength workability retention, permeability testing, chloride content restriction, maximum cement content, etc.	
Concrete Testing (Frequency)	
Material's Testing (any non-routine requirements)	
Alternatives to be offered: Yes/No	
Method of Curing to be used by contractor	
Quantity (m3)	

**3.2 Calibration and Weighing Equipment Accuracy**

The following limits shall apply to all ready-mixed concrete plants :

- a. The accuracy, sensitivity and arrangement of the weighing devices shall be such as to enable the materials to be batched within the following tolerances :

(1) Cement, mineral Admixtures : Within + 2 percent of the quantity of the constituent being measured
(2) Aggregate, chemical admixtures and water: Within + 3 percent of the quantity of the constituent being measured.

- (b) Analogue scales shall have scale increments not exceeding 5 kg. for cement and mineral admixtures, 25 kg. for aggregate and 2 kg. for water.
- (c) Preset controls shall be calibrated in increments not exceeding 5 kg. for cement and mineral admixtures, 10 kg. for aggregate and 2 kg. for water.
- (d) For continuous mixer plants calibration shall be in increments not exceeding 10 kg./cum for cement and mineral admixtures, 25 kg./cum for aggregates and 10 l/cum for water.
- (e) Digital readings shall have a scale increments not exceeding 2 kg. for cement and mineral admixtures, 10 kg. for aggregate and 10 for water.
- (f) At the time of installation, or reconditional the accuracy of the indicated mass at any point on the scale shall be within 0.25 percent of the full scale reading.
- (g) Any other time during the masonry operation the accuracy shall be within 0.50 percent of the full scale reading.
- (h) Chemical Admixture dispensers shall have scale increment for exceeding.

Ranger of scale in kg/l	Scale increment in Kg/l
0.1 - 0.5	0.01

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0.5 - 1.0	0.02
1.0 – 10.0	0.2
more than 10.0	0.4

(i) All weighing and measuring equipment shall be tested and calibrated over its full working range at the following intervals :

(1) Mechanical /knife edge systems : At least once every two month

(2) Electrical /load cell systems : At least once every three months

Adequate and identified facilities shall be provided for the application of the test loads.

(j) In the case of batch weighing systems testing and calibration shall be based on the application test loads to the weigh hoppers.

(k) Checks on continuous weigh systems shall be based on comparison of preset quantities with those actually produced.

(l) To achieve the required accuracy of calibration, a minimum of 500 kg. of stamped weights required, except that for low capacity scale an acceptable limit on the total mass of calibre weight would be 20 percent of the scale capacity.

(m) When calibration of weighing equipment is carried out all personnel involved should be competent and fully trained, the procedures should be fully documented, and special attention should be paid to the health and safety aspects of the procedure.

### 3.3 Delivery Ticket Information

The following information shall be included in the delivery ticket to accompany the load to the purchaser :

(a) Name or number of the ready-mixed concrete depot

(b) Serial number of the ticket

(c) Date

(d) Truck number

(e) Name of the Purchaser

(f) Name and location of site

(g) Grade or mix description of the concrete

(h) Specified target workability

(i) Minimum cement content (if specified)

(j) Type of cement and grade (if specified)

(k) Maximum free water-cement ratio (if specified)

(l) Nominal maximum size of aggregate

(m) Generic Type or name of any chemical and mineral admixtures included.

(n) Quantity of concrete in cum

(o) Time of loading

(p) Signature of the plant operator

(q) A statement warning the purchaser of the precautions needed to be taken when working

with cement and wet concrete.

On site the following information will be added. :

- (a) Time of arrival on site.
- (b) Time when discharge was completed.
- (c) Any water/admixture added by the supplier to meet the specified workability.
- (d) Any extra water /admixture added at the request of the purchaser of the concrete, or his representative, and his signature.
- (e) Pouring location.
- (f) Signature of the purchaser or his representative conforming discharge of the load.

#### **4. Tests on “Crushed Sand”**

The following tests shall be carried out for the use of “Crushed Sand”;

- a. Sieve analysis
- b. Specific gravity
- c. Water absorption
- d. Bulk density
- e. Alkali aggregate reaction
- f. Soundness
- g. Deleterious materials
- h. Organic impurities
- i. Micro fines content
- j. Tests for silt and clay
- k. fineness modulus test

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**Mandatory Tests**

<b>Material</b>	<b>Test</b>	<b>Field /Lab</b>	<b>Test procedure</b>	<b>Minimum quantity of material for carrying out test</b>	<b>Frequency of testing</b>
Water	i.pH value	Lab	IS:3025	-	Water from each source shall be got tested before commencement of the work and thereafter once in every three months till the completion of work. Water from municipal source need be tested once in six months. Number of tests from each source shall be three.
	ii. Limits of acidity	Lab			
	iii. Limits of alkalinity	Lab			
	iv. Percentage of solids;				
	a. Chlorides	Lab			
	b. Sulphates				
	c. Suspended matter				
	d. Inorganic solids				
	e Organic solids				
Cement	Physical requirement;	Lab		Each lot	Every 50 tonnes or part thereof. Each brand of cement brought to site shall be tested as per this frequency or once for each source of supply & occasionally when called for in case of long/improper storage as per the requirements
	i. Fineness		i.IS4031Pt II		
	ii. Soundness		ii.IS4031Pt III		
	iii. Setting time (Initial & Final)		iii.IS4031Pt V		

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	iv. Compressive strength		iv.IS 4031 Pt VI		of Engineer in Charge. Besides, the contractor will also submit daily test data on cement released by the manufacturer.
	v. Consistency of standard cement paste		v.IS 4031 Pt VI		
	vi. Specific Gravity		IS2720 Pt 3		
Sand	Organic impurities	Field	As per Appendix "A"	20cum	Every 20cum or part thereof or more frequently as decided by Engineer in Charge.
	Silt & clay content/Silt factor	Field	As per Appendix "C"	20cum	-do-. At beginning & if there is change in source and two tests per day as per the requirements of Engineer in Charge.
	Particle size distribution (Sieve analysis)	Field or Lab as decide by Engineer in Charge	As per Appendix "B"	40cum	40cum or part thereof. At beginning & if there is change in source and two tests per day as per the requirements of Engineer in Charge.
	Bulking of sand	Field	As per Appendix D"	20cum	Every 20cum or part thereof or more frequently as decided by Engineer in Charge. At beginning & if there is change in source and two tests per day as per the requirements of Engineer in Charge.



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Stone aggregates	Percentage of soft & deleterious materials	Field/Lab as required	IS2386 Part II	As required by Engineer in charge	For all quantities and once for each source of supply & subsequently on monthly basis as per the requirements of Engineer in Charge
	Particle size	Field/Lab	As per Appendix "B"	45cum	For every 45cum or part thereof for RCC work only and for other items as decided by Engineer in Charge and once for each source of supply & subsequently on monthly basis as per the requirements of Engineer in Charge
	Organic impurities	-do-	IS2386 Part II	10cum	Every 40cum or part thereof and once for each source of supply & subsequently on monthly basis as per the requirements of Engineer in Charge
	Surface moisture	-do-	IS2386	10cum	-do-
	10% fine value	-do-	-do-	-do-	-do-
	Specific gravity	-do-	-do-	-do-	-do-
	Bulk density	-do-	-do-	-do-	-do-
	Aggregate crushing strength	-do-	-do-	-do-	-do-
	Aggregate impact value	-do-	-do-	-do-	-do-
Concrete	Slump test and compressive strength	Field/Lab	IS 516, Appendix E	10cum	Every 10cum or part thereof. 2 set of cubes (One for 7 days & other for 28 days strength) or minimum 6 cubes per day's work whichever is more.

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					One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
Reinforced Cement Concrete (Nominal Mix)	Slump Test	Field/Lab	IS 516, Appendix E	i.5cum in case of column	i. Every 5cum or part thereof. 2 set of cubes (One for 7 days & other for 28 days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
				ii.20cum for slabs, beams and connected columns	ii. Every 20cum or part thereof. 2 set of cubes (One for 7 days & other for 28 days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done



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				each change of source	
ii.Cement				ii. 50 MT or on each change of source	
iii.Fresh Concrete	iiia.Slump test	iiia. Field/Lab	iiia.IS 516, Appendix - E	iiia. 10cum or part thereof	iiia.50cum for RCC work including in all other small locations. If RCC done in a day is less than 50cum, test may be carried out as required by Engineer in charge. . 2 set of cubes (One for 7 days& other for 28 days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
	iiib.Cube test	iiib. Lab	iiib. IS516, Appendix "F"	iiib.10cum or part thereof	iiib. 50cum or 10 batches of 5-7 cum each for RCC work including in all other small locations. If RCC done in a day is less than 50cum, test may be carried out as required by Engineer in charge. 2 set of cubes (One for 7

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					days& other for 28 days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
RCC : Ready Mix			As per IS 4926		
i.Coarse and fine aggregates				i.50cum or part thereof and also on each change of source or as decided by Engineer in charge	
ii.Cement				ii. 50 MT or on each change of source or as decided by Engineer in charge	
iii.Fresh concrete	iiia.Slump test	iiia. Field/Lab	iiia.IS 516, Appendix "E"	iiia. 10cum or part thereof or as decided by Engineer in charge	iiia.50cum for RCC work including in all other small locations. If RCC done in a day is less than 50cum, test may be carried out as required by Engineer in charge. 2 set of cubes (One for 7 days & other for 28

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					days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.
	iiib. Cube test	iiib. Lab/Field	iiib. IS 516, Appendix "F"	iiib.10cum or part thereof or as decided by Engineer in charge	iiib. 50cum or 10 batches of 5-7 cum each for RCC work including in all other small locations. If RCC done in a day is less than 50cum, test may be carried out as required by Engineer in charge. 2 set of cubes (One for 7 days & other for 28 days strength) or minimum 6 cubes per day's work whichever is more. One test per each dumper load at both batching plant site & paving site initially when work starts. Subsequently sampling may be done from alternate dumper.

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Steel for RCC work	Physical and Chemical tests, weight per meter, elongation test and as below;	Lab			For all tests :One test for every 5 metric tonnes or part thereof for each diameter of bar.
	i.Tensile strength ii.Bend test iii.Weight per meter		IS1599		
Bricks	Dimensions, compressive strength, water absorption and efflorescence	Lab	IS 3495 Appendix "A"		As per requirement of engineer in charge
Stone	i.Water absorption	Lab	i.IS1124	10cum in stone masonry	10cum or part thereof
	ii. transverse strength		ii.IS1121 Part II		
	iii. Resistance to wear		iii.IS1706		
	iv.Durability		iv.IS1126		
Granite	i.Moisture absorption	Lab	i.IS1124	50sqm	100sqm or part thereof

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	ii. Specific gravity		ii. IS1122		
Timber	Moisture content	Field (By moisture meter and Lab if required by Engineer in Charge)	Appendix "C"	1 cum	1 cum or part thereof
Structural steel	Bend test, Tensile test	Lab	IS2062	20MT	20MT or part thereof as per directions of Engineer in Charge

The contractor shall submit details of the tests carried out in prescribed proforma (Annexure - 14) along with each running bill.

**Annexure - 14: Proforma for the mandatory tests to be attached with the running bills**

Sl no.	Item	Quantities as per the agreement	Frequency as per contract	No. of tests required	Upto date quantity	No. of tests required	No. of tests actually done	Remarks
1	2	3	4	5	6	7	8	9



## Appendix A

### Test for Organic Impurities

The aggregate must also be checked for organic impurities such as decayed vegetation humus, coal dust etc.

What is called the colour test is reliable indicator of the presence of harmful organic matter in aggregate, except in the area where there are deposits of lignite.

Fill a 350 ml clear glass medicine bottle upto 70 ml mark with a 3% solution of caustic soda or sodium hydroxide. The sand is next added gradually until the volume measured by the sandy layer is 125 ml. The volume is then made upto 200 ml by addition of more of solution. The bottle is then stoppered and shaken vigorously and allowed to stand for 24 hours. At the end of this period, the colour of the liquid will indicate whether the sand contains a dangerous amount of matter. A colourless liquid indicates a clean sand free from organic matter. A straw coloured solution indicates some organic matter but not enough to be seriously objectionable. Darker colour means that the sand contains injurious amounts and should not be used unless it is washed, and a retest shows that it is satisfactory.

Add 2.5 ml of two per cent solution of tannic acid in 10 per cent alcohol, to 97.5 ml of three percent sodium hydroxide solution. Place in a 350 ml bottle, fix the stopper, shake vigorously and allow to stand for 24 hours before comparison with the solution above the sand.

**Note:** A three per cent solution of caustic soda is made by dissolving 3 g of sodium hydroxide in 100 ml of water, preferably distilled. The solution should be kept in a glass of bottle tightly closed with a rubber stopper. Handling sodium hydroxide with moist hands may result in serious burns. Care should be taken not to spill the solution for it is highly injurious to clothing, leather, and other materials.

## Appendix B

### Test for Particle Size (Sieve Analysis)

**Apparatus:** Perforated plate sieves of designation 10 mm, 4.75 mm and fine mesh sieve of designation 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron should be used.

The balance or scale shall be such that it is readable and accurate to 0.1 per cent of the weight of the test sample.

**Sample:** The weight of sample available shall not be less than the weight given in the table below. The sample of sieving shall be prepared from the larger sample either by quartering or by means of a sample divider.

**Table showing minimum weights for sampling**

Maximum size present in substantial proportions (mm)	Minimum weight of sample for sieving (Kg)
10	0.5
4.75	0.2
2.36	0.1

**Test Procedure:** The sample shall be brought to an air-dry condition before weighing and sieving. This may be achieved either by drying at room temperature or by heating at a temperature of 100 degree to 110 degree centigrade. The air dry sample shall be weighed and sieved successively on the appropriate sieves starting with the largest. Care shall be taken to ensure that the sieves are clean before use.

Each sieve shall be shaken separately over a clean tray until not more than a trace passes, but in any

case for a period of not less than two minutes. The shaking shall be done with a varied motion, backwards and forwards, left to right, circular clockwise and anti-clockwise, and with frequent jarring, so that the material is kept moving over the sieve surface in frequently changing directions. Materials shall not be forced through the sieve by hand pressure, but on sieves coarser than 20 mm, placing of particles is permitted, Lumps of fine material, if present may be broken by gentle pressure with fingers against the side of the sieve. Light brushing of under side of the sieve with a soft brush may be used to clear the sieve openings.

Light brushing with a fine camel hair brush may be used on the 150 micron IS sieve to prevent segregation of powder and blinding of apertures. Stiff or worn out brushes shall not be used for this purpose and pressure shall not be applied to the surface of the sieve to force particles through the mesh.

On completion of sieving the material retained on each sieve, together with any material cleaned from the mesh, shall be weighed.

**Reporting of Results:** The results shall be calculated and reported as:

(a) The cumulative percentage by weight of the total sample passing each of the sieves, to the nearest whole number:

Or

(b) The percentage by weight of the total sample passing one sieve and retained on the next smaller sieve, to the nearest 0.1 percent.

## **Appendix C**

### **Test for Silt Content**

The sand shall not contain more than 8% of silt as determined by field test with measuring cylinder.

The method of determining silt contents by field test is given below:

A sample of sand to be tested shall be placed without drying in a 200 ml measuring cylinder.

The

volume of the sample shall be such that it fills the cylinder upto 100 ml mark. Clean water shall be added upto 150 ml mark. Dissolve a little salt in the water in the proportion one tea spoon to half a litre. The mixture shall be shaken vigorously, the last few shakes being sidewise direction to level off the sand and the contents allowed to settle for three hours.

The height of the silt visible as settled layer above the sand shall be expressed as a percentage of the height of sand below. The sand containing more than the above allowable percentage of silt, shall be washed so as to bring the silt contents within allowable limits.

## Appendix D

### Bulking of Fine Aggregates/Sand (Field Methods)

Two methods are suggested for determining the bulking of sand/fine aggregate. The procedure

may be suitably varied, if necessary. Both depend on the fact that the volume of inundated sand/fine aggregate is the same if the sand/fine aggregate were dry.

**Method -1:** Put sufficient quantity of sand loosely into a container until it is about two-third full. Level off the top of the sand and push a steel rule vertically down through the sand at the middle to bottom, measure the height. Suppose this is 'X' cm.

Empty the sand out of the container into another container where none of it is lost. Half fill the first container with water. Put back about half the sand and rod it with a steel rod, about 6 mm in diameter, so that its volume is reduced to a minimum. Then add the remainder and level the top surface of the inundated sand. Measure its depth at the middle with the steel rule. Suppose this is 'Y' cm.

The percentage of bulking of the sand due to moisture shall be calculated from the formula:

$$\text{Percentage bulking} = (X/Y - 1) \times 100$$

**Method -2:** In a 250 ml measuring cylinder, pour the damp sand, consolidate it by staking until it reached the 200 ml mark.

Then fill the cylinder with the water and stir the sand well (the water shall be sufficient to submerge the sand completely). It will be seen that the sand surface is now below its original level. Suppose the surface is at the mark of Yml, the percentage of bulking of sand due to moisture shall be calculated from the formula.

$$\text{Percentage bulking} = (200/Y - 1) \times 100$$

**Appendix E**

**Slump Test**

Mould shall consist of a metal frustum of cone having the following internal dimensions:

Bottom diameter.....	20 cm
Top diameter.....	10 cm
Height.....	30 cm

The mould shall be of a metal other than brass and aluminium of at least 1.6 mm (or 16 BG) thickness. The top and bottom shall be open and at right angles to the axis of the cone. The mould shall have a smooth internal surface. It shall be provided with suitable foot pieces and handles to facilitate lifting it from the moulded concrete test specimen in a vertical direction as required by the test.

A mould provided with a suitable guide attachment may be used.

Tamping rod shall be of steel or other suitable material 16 mm in diameter 60 mm long and rounded at one end.

**Procedure:** The internal surface of the mould shall be thoroughly cleaned and free from superfluous moisture and any set concrete before commencing the test. The mould shall be placed on a smooth horizontal, rigid and non- absorbent surface viz. levelled metal plate. The operator shall hold the mould firmly in place while it is being filled with test specimen of concrete. The mould shall be filled in four layers, each approximately one quarter of height of mould. Each layer shall be tamped with twenty five strikes of the rounded end of the tamping rod. The strokes shall be distributed in a uniform manner over the cross section of the mould and for the second and subsequent layers shall penetrate into the under-lying layer. The bottom layer shall be tamped throughout its depth. After the top layer has been rodded, the concrete shall be struck off level with trowel or the tamping rod, so that the mould is exactly filled. Any mortar which shall leak out between the mould and the base plate shall be cleaned away.

The mould shall be removed from the concrete immediately after filling by raising it slowly and carefully in a vertical direction. The moulded concrete shall then be allowed to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of specimen.

The above operations shall be carried out at a place free from vibration or shock, and within a period of two minutes after sampling.

**Result:** The slump shall be recorded in terms of millimeters of subsidence of the specimen during the test. Any slump specimen which collapses or shears off laterally give incorrect result. If this occurs, the test shall be repeated with another sample.

The slump test shall not be used for very dry mixes as the results obtained are not accurate.

## **Appendix F**

### **Cube Test for Compressive Strength of Concrete**

One sample (consisting of six cubes 15x15x15 cm shall be taken for every 20 cum or part thereof

concrete work ignoring any part less than 5cum or as often as considered necessary by the Engineer -in-Charge. The test of concrete cubes shall be carried out in accordance with the procedure as described below. A register of cubes shall be maintained at the site of work as prescribed. The casting of cubes, concrete used for cubes and all other incidental charge, such as curing, carriage to the testing laboratory shall be borne by the contractors.

### **Test Procedure**

#### **1.Mould**

The mould shall be of size 15 cmx15 cmx15 cm for the maximum nominal size of aggregate not

exceeding 40 mm. For concrete with aggregate size more than 40 mm size of mould shall be specified by the Engineer- in-charge, keeping in view the fact that the length of size of mould should be about four times the size of aggregate.

The moulds for test specimens shall be made of non- absorbent material and shall be substantially strong enough to hold their form during the moulding of test specimens. They shall not vary from the standard dimensions by more than one percent. The moulds shall be so constructed that there is no leakage of water from the test specimen during moulding. All the cube moulds for particular site should, prior to use, be checked for accuracy in dimensions and geometric form and such test should at least be made once a year.

Each mould shall be provided with a base plate having a plane surface and made of non-absorbent material. This plate shall be large enough in diameter to support the moulds properly without leakage.

Glass plates not less than 6.5mm thick or plain metal not less than 12mm thick shall be used for this purpose. A similar plate shall be provided for covering the top surface of the test specimen when moulded.

**Note:** Satisfactory moulds can be made from machine or steel castings, rolled metal plates or galvanized.

### **2.Sample of Concrete**

Sample of concrete for test specimen shall be taken at the mixer or in the case of ready mixed concrete from the transportation vehicle discharge or as directed by Engineer-in-Charge. Such samples shall be obtained by repeatedly passing a scoop or pail through the discharge stream of concrete.

The sampling operation should be spread over evenly to the entire discharging operation. The samples thus obtained shall be transported to the place of moulding of the specimen to counteract segregation. The concrete shall be mixed with a shovel until it is uniform in appearance. The location in the work of the batch of concrete this sampled shall be noted for further reference. In case of paving concrete, samples shall be taken from the batch immediately after deposition of the sub grade. At least five samples shall be taken from different portion of the pile and these samples shall be thoroughly mixed before being used to form the test specimen. The sampling shall be spread as evenly as possible throughout the day. When wide changes occur during concreting, additional sample shall be taken if so desired by the Engineer-in -Charge.

### **3.Preparation of Test Specimens**

The interior surfaces of the mould and base plate shall be lightly oiled before the concrete is placed in the mould. The samples of concrete obtained as described under the test specimen shall be immediately moulded by one of the following methods as indicated below:-

When the job concrete is compacted by manual methods, the test specimen shall be moulded by placing the fresh concrete in the mould in three layers, each approximately one third of the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge do the mould as the concrete there sided from it, in order to ensure a uniform distribution of concrete within the mould. Each layer shall be rodded 35 times with 16 mm rod, 60 cm in length, bullet pointed at the lower end. The strokes shall be distributed in uniform manner over the cross section of the mould and shall penetrate into underlying layer. The bottom layer shall be rodded through its depth.

After the top layer has been rodded, the surface of the concrete shall be struck off with a trowel and covered with a glass plate at least 6.5 mm thick or a machined plate. The whole



process of moulding shall be carried out in such a manner as to preclude the change of the water cement ratio of the concrete, by loss of water either by leakage from the bottom or over flow from the top of the mould.

When the job concrete is placed by vibration and the consistency of the concrete is such that the

test specimens cannot be properly moulded by hand rolling as described above, the specimens shall be vibrated to give a compaction corresponding to that of the job concrete. The fresh concrete shall be placed in mould in two layers, each approximately half the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a symmetrical distribution of concrete within the mould. Either internal or external vibrators may be used. The vibration of each layer shall not be continued longer than is necessary to secure the required density. Internal vibrators shall only be used when the concrete is required to be compacted in layers. In compacting the first layer, the vibrators shall not be allowed to rest on the bottom of the mould. In placing the concrete for top extent that there will be no mortar loss during vibrations. After vibrating the second layer enough concrete shall be added to bring level above the top of the mould. The surface of the concrete shall then be struck off with a trowel and covered with a glass or steel plate as specified above. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of water-cement ratio of the concrete by loss of water, either by leakage for the bottom or over flow from the top of the mould.

#### **4. Curing and Storage of Test Specimen**

In order to ensure reasonably uniform temperature and moisture conditions during the first 24 hours for curing the specimen and to protect them from damage, moulds shall be covered with wet straw or gunny sacking and placed a storage box so constructed and kept on the work site that its air temperature when containing concrete specimens shall remain 22°C to 33°C. Other suitable means which provide such a temperature and moisture conditions may be used.

**Note:-** It is suggested that the storage box be made of 25 mm dressed tongued and grooved timber, well braced with battens to avoid warping. The box should be well painted inside and outside and should be provided with a hinged cover and padlock.

The test specimen shall be removed from the moulds at the end of 24 hours and stored in a moist condition at a temperature within 24°C to 30°C until the time of test. If storage in water is desired, a saturated lime solution shall be used.

#### **5. Testing**

The specimens shall be tested in accordance with procedure as described below:

- (a) The tests shall be made at an age of concrete corresponding to that for which the strengths are specified.
- (b) Compression tests shall be made immediately upon removal of the concrete test specimen from the curing room i.e. the test specimen shall be loaded in damp condition. The dimensions of the test specimens shall be measured in mm accurate to 0.5 mm.
- (c) The metal bearing plates of the testing machine shall be placed in contact with the ends of the test specimens. Cushioning materials shall not be used. In the case of cubes, the test specimen shall be placed in the machine in such a manner that the load is applied to sides of the specimens as cast. An adjustable bearing block shall be used to transmit the load to the test specimen. The size of the bearing block shall be the same or slightly larger than that of test specimen. The upper or lower section of the bearing block shall be kept in motion as the head of the testing machine is brought to a bearing on the test specimen.
- (d) The load shall be applied axially without shock at the rate of approximately 140 kg. Per sq.cm. per minute. The total load indicated by the testing machine at failure of test specimen shall be recorded and the unit compressive strength is calculated in kg per sq. cm. Using the area computed from the measured dimension of the test specimen. The type of failure and Appearance of the concrete shall be noted.

## **Appendix G**

### **Moisture content of Timber**

Moisture content of timber shall be checked for every 1 cum or part thereof by electrical moisture meters as per IS 287.

Electrical moisture meters are of resistance type and shall be used when the moisture content is within a range of 8 to 25 per cent. When checking moisture content with electrical moisture meter, it shall be ensured that :

- (a) Timber is not hot or surface wet and the moisture gradient is not large due to wet cores.
- (b) Electrode probes are of adequate depth (not less than one-fifth the thickness of the timber).

Sufficient number of reading at different positions are taken on each piece of timber to eliminate localised variations in surface moisture and species corrections are applied for the make of electrical resistance type moisture meter.

If for any reason, whatsoever, the result of electrical moisture are not to be relied upon the moisture content shall be checked by the oven drying method.

For checking moisture content by oven drying method, a complete test cross section, 12 to 19 mm long in the direction of timber grain, free from all defects shall be cut from each piece of timber selected for test as follows :

- (a) If weighing can be done immediately, the test section shall be cut from a point at least 45 cm from one end of the piece or from its centre.
- (b) In case cutting of test section from the piece is not permissible the moisture content in the whole section can also be determined by collecting a boring to a depth of half of the thickness of the piece by means of an auger, in a preweighed weighing bottle which should then be sealed properly.

The test sections obtained above shall be weighed, immediately after cutting, on a balance the sensitivity of which is not less than 10 mg. They shall be dried in a ventilated, and preferably thermostatically controlled, oven at a temperature of 100°C to 105°C until the weight is constant. The weight of the test section shall be deemed to have become constant if successive weighing at intervals of 2 to 5 hours do not differ from one another by more than 50 mg. The test weight shall be taken to be the oven dry weight of the test section.

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The percentage moisture content in the test section shall be calculated as follows :

$$\text{Moisture content (Per cent)} = \frac{W1 - WO}{WO} \times 100$$

Where :

W1 = initial weight of test section and

WO = oven dry weight of test section

When moisture content of timber is checked by oven drying method, results of electrical moisture meter shall be ignored.

**Appendix H**

**Physical Requirements of Fly ash**

Sl No.	Characteristics	Requirements of fly ash	
		For use as Pozzolana	For use as admixture in cement mortar and concrete
1	2	3	4
(i)	Fineness – Specific surface in m <sup>2</sup> /kg by Blaine’s permeability method, min.	320	200
(ii)	Lime reactivity – average compressive strength in N/mm <sup>2</sup> , Min.	4.5	-
(iii)	Compressive strength at 28 days in N/mm <sup>2</sup>	Not less than 80 percent of the strength of corresponding mortar cubes	-
(iv)	Soundness of autoclave test expansion of specimens, percent, Max	0.8	0.8
(v)	Particles retained on 45 micron IS sieve (wet sieving) in percent, Max	34	50

**CONDITIONS OF CONTRACT**

(Modification as per the GR PWD NO. CAT-1087/ CR- 94/Bldg-2, dated 14.6.1989)

*Security  
Deposit*

Clause 1 : The person / person whose tender may be accepted (hereinafter called the Contractor, which expression shall unless excluded by or repugnant to the context include his heirs, executors, administrators and assigns) shall (A) within ten days (which may be extended by the CEO concerned up to 15 days if the CEO thinks fit to do so) of the receipt by him of the notification of the acceptance of his tender deposit with the Engineer in-charge in Cash or Government securities endorsed to the Engineer in charge (if deposited for more than 12 months) of sum sufficient which will make up the full security deposit specified in the tender or (B) (permit ASCDCL at the time of making any payment to him for work done under the contract to deduct such sum as will amount to 5% of all moneys so payable; such deductions to be held by ASCDCL by way of security deposit). Provided always that in the event of the Contractor depositing a lumpsum by way of security deposit as contemplated at (A) above, then and in such case, if the sum so deposited is less than 5% of the tendered cost, it shall be lawful for ASCDCL at the time of making any payment to the contractor for work done under the contract to make-up the full amount of five (5) percent by deducting a sufficient sum from every such payment as last aforesaid until the full amount to the security deposit is made up. All compensation or other sums of moneys payable by the contractor to ASCDCL under the terms of his contract may be deducted from or paid by the sale of sufficient part of his security deposit or from the interest arising there from, or from any sums which may become due by ASCDCL to the contractor under any other contract or transaction on any account whatsoever and in the event of his security deposit being reduced by reason of any such deduction or sale as aforesaid, the contractor shall, within ten days thereafter, make good in cash or Government securities endorsed as aforesaid or Bank Guarantee issued by bank for any sum or sums which may have been deducted from or raised by sale of his security deposited or any part thereof. The Security deposit referred to, when paid in cash may, at the cost of the depositor, be converted into interest bearing securities provided that the depositor has expressly desired this in writing.

If the amount of the security deposit to be paid in a lump sum within the period specified at (A) above is not paid the tender/contract already accepted shall be considered as cancelled and legal steps taken against the Contractor

## CONSTRUCTION OF SMART CITY BUS DEPOT AT MUKUNDWADI, AURANGABAD

for recovery of the amounts. The security deposit shall be withheld until two (2) months after the expiry of the Defect Liability Period. Remaining 10% will be Security Deposit released after expiry of defect liability period. In the event of Contractor failing or neglecting to complete rectification work within the period upto, which the Contractor has agreed to maintain the work in good order then subject to provisions of Clause 17 and 20 hereof, the amount of security deposit retained by ASCDCL shall be adjusted towards the excess cost incurred by the ASCDCL on rectification work.

*Compensation for Delay* Clause 2: The time allowed for carrying out the work as entered in the agreement shall be strictly observed by the Contractor and shall be reckoned from the date on which the order to commence work is given to the Contractor. The work shall throughout the stipulated period of the contract be proceeded with, all due diligence (time being deemed to be essence of the contract on the part of the Contractor) and the Contractor shall pay as compensation an amount equal to one percent or such smaller amount as the CEO (whose decision in writing shall be final ) may decide of the amount of the estimated cost of the whole work as shown by the tender for everyday that the work remains uncommenced or unfinished after the proper dates. And further to ensure good progress during execution of the work, the Contractor shall be bound in all cases in which the time allowed for any work exceeds one month to complete, for complete minimum quantum of work as compared to accepted tender cost as stated 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 work in 8 (Eight) months including monsoon

Note: The quantity of the work to be done within a particular time to be specified above shall be fixed by an Officer competent to accept the contracts after taking into consideration the circumstances of each case. And insert in the blank space kept for the purpose.

In the event of the contractor failing to comply with these conditions he shall be liable to pay as compensation an amount equal to one percent or such smaller amount as CEO (whose decision in writing shall be final) may decide of the said estimated cost of the whole work for everyday that the due quantity of work remains incomplete provided always that the total amount of compensation to be paid under the provisions of this clause shall not exceed 10% of the estimated cost of the work as shown in the tender. CEO should be the final authority in this respect.

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*Action when whole of security deposit is forfeited*

Clause 3: If any clause in which under any clause of this contract the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit (whether paid in one sum or deducted by instalment) or in the case of abandonment of the work owing to serious illness or death of the Contractor or any other cause, the Engineer in charge on behalf of the ASCDCL shall have power to adopt any of the following courses, as he may deem best suited to the interest of the ASCDCL to rescind the contract (for which rescission notice in writing to the Contractor under the hands of Engineer in-charge 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 ASCDCL.

a) 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, plant and charges on additional supervisory staff including the cost of work- charged establishment employed for getting unexecuted 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 has been carried out by the Contractor under the terms of his contract. The certificate of the Engineer in-charge as to the cost 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.

b) The order that work of the Contractor be measured up and take such part thereof as shall be unexecuted 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 other contractors 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 Engineer in-charge as to all the costs of the work and other expenses incurred as aforesaid for getting the unexecuted Work done by the new contractor and as to the value of the work so done shall be final and conclusive against the Contractor.

c) In case the contractor shall be rescinded under clause (a) above, the contractor shall not be entitled to recover or to be paid, any sum for any work therefore actually performed by him under this contract unless and until the Engineer in charge / CEO 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 the courses referred to in clause (b) or (c) being adopted and the cost of the Action when whole of security deposit is forfeited work executed departmentally or through a new contractor and other allied expenses exceeding the value of such work credited to the contractors, the amount of excess shall be deducted from any money due to the contractor by ASCDCL under the contract or otherwise however or from his security deposit or the sale proceeds thereof provided however that the contractor shall have to claim against ASCDCL event 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) and (c) is adopted by the ASCDCL the contractor shall have no claim to compensation for any loss sustained by him by reason of not having purchased or procured any materials, or entered into 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. The extra cost involved in the completion of the balance work carried out through the other contract or under 3 (c) shall be recoverable from the contractor over and above the compensation levied under Clause 2 and the Security Deposit shall be apportioned against the total recoveries for this purpose also.

*Action when the progress of any particular portion of the work is unsatisfactory.*

Clause 4: If the progress of the any particular portion of the work is unsatisfactory, the ASCDCL shall not be withstanding that the general progress of the work is in accordance with the condition mentioned in clause 2 be entitled to take action under clause 3(b) after giving the contractor 10 days' notice in writing. The contractor will have no claim for compensation, for any loss sustained by him owing to such action when the progress of any particular portion of the work is unsatisfactory.

*Contractor liable to pay compensation if action not taken under clause 3 and 4*

Clause 5 : In any case in which any of the powers conferred upon ASCDCL by Clause 3 and 4 hereof shall have become exercisable and the same shall not have been exercised the non-exercise thereof shall not constitute waiving of any of the conditions hereof the such powers shall not withstanding be exercisable in the event of any future case of default by the contractor for under any clauses hereof he is declared liable to pay compensation amounting to the whole of his security deposit and the liability of the contractor for past and future compensation shall remain unaffected. In the event of the ASCDCL taking action under Sub-Clause (a) or (c) of clause 3, he may, if he so desires, take possession of all or any tools and plants, materials and stores, in or upon the work or the site thereof or belonging to

the contractor, or procured by him and intended to be used for the execution of the work or any part thereof 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 ASCDCL whose certificate thereof shall be final.

In the alternative the ASCDCL may after giving notice in writing Contractor liable to pay compensation if action not taken under clause 3 and 4 to the contractor or his clerk of the work, foreman or other authorized agent require him to remove such tools, plant, materials or stores from the premises within a time to do specified in such notice, and in the event of the contractor failing to comply with any such requisition, the ASCDCL may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and at his risk in all respects, and the certificate of the ASCDCL as to the expenses of any such removal and the amount of the proceeds and expense of any such shall be final and conclusive against the contractor.

*Extension of  
Time*

Clause 6 : If the contractor shall desire an extension of the time for completion of work on the ground of his having been unavoidably hindered in its execution or on any other ground, he shall apply in writing to the ASCDCL before the expiration of the period stipulated in the tender on before the expiration of 30days from the date on which he was hindered as aforesaid or on which the cause for asking extension occurred, whichever is earlier and the ASCDCL or in the opinion of CEO, as the case may be, if in his opinion, there were reasonable grounds for granting the extension, grant such extension as he think necessary or proper. The decision of the ASCDCL in this matter shall be final.

*Final  
Certificate*

Clause 7 : On the completion of the work the contractor shall be furnished with a certificate by the ASCDCL (hereinafter and hereinbefore called the Engineer-in-charge) of such completion but neither such certificate shall be given nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall have been executed, all scaffolding surplus materials and rubbish , tools, plants and equipment's and shall have cleaned off the dirt from all woodwork, doors, windows, walls, floor or other parts of any building in or upon which the work has been executed or of which he may have had possession for the purpose of executing the work nor until the work shall have been measured by the Engineer-in-charge or where the measurements have been taken by his subordinate until they have received approval of the Engineer-in-charge

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the said measurements being binding and conclusive against the contractor, if the contractor shall fail to comply with the requirements of this clause as to the removal of scaffolding, surplus materials and rubbish and cleaning off the dirt on or before the date fixed for the completion of the work, the Engineer-in-charge may at the expense of the contractor, remove and rubbish and dispose of the same as the thinks fit and clean off such dirt as aforesaid and the contractor shall forthwith pay the amount of all expenses so incurred but shall have no claim in respect of any such scaffolding tools and plants equipment's or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

*Payment on intermediate certificate to be regarded as advance*

Clause 8: No payment shall be made for any work estimated to cost less than Rupees one thousand till the whole of work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than Rupees one thousand the

contractor shall on submitting a monthly bill therefore be entitled to receive payment proportionate to the part of the work then approved recommended by the Engineer-in-charge, whose certificate of such recommended and passing of the sum of payable shall be final and conclusive against the contractor. All such intermediate payments shall be regarded as payment by way of advance against the final payments only and not as payments for work actually done and completed and shall not preclude the Engineer-in-charge for 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 occurring of any claim nor shall it conclude determine or affect in any other way the powers of the Engineer-in-charge as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affect 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-in-charge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

*Payment at reduced rates on account of items of work not accepted as completed, to be at the*

Clause 9: The rates for several items of works estimated to cost more than 1000/- agreed to within, shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specification. In cases where the items of work

not accepted as so completed by the Engineer-in-charge may make payment

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*discretion of the Engineer-in-charge* on account of such items at such reduced rates as he may consider reasonable in the preparation of final or on account bills.

Payment at reduced rates on account of items of work not accepted as completed, to be at the discretion of the Engineer-in-charge.

*Bills to be submitted monthly* Clause 10: A bill shall be submitted by the contractor in each month on or before the date fixed by the Engineer-in-charge for all work executed in the previous month and the Engineer-in-charge shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim, so far as it is admissible shall be adjusted and paid if possible within ten 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 the Engineer-in-charge may prepare a bill from such list which shall be binding on the contractor in all respects.

*Bills to be on printed form* Clause 11: The contractor shall submit all bills on the printed forms to be had on application at the office of the Engineer-in-charge. The charges to be made in the bills shall always be entered at the rates specified in the tender or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for in the tender at the rates hereinafter provided for such work.

*Stores supplied by ASCDCL* Clause 12 : If the specification or estimate of the work provides for the use of any special description of materials to be supplied from the store of the ASCDCL or if it is required that the contractor shall use certain stores to be provided by the Engineer-in-charge (such material and stores and the prices to be charged therefore as hereinafter mentioned being so far as practicable for the convenience of the contractor but not so as in any way to control the meaning or effect of this contract specified in the schedule or memorandum hereto annexed) the contractor shall be supplied with such materials and stores as may be required from time to time to be used by him for the purposes of the contract only and value of the full quantity of the materials and stores so supplied shall be set off or deducted from any sums then due, or thereafter to become due to the contractor under the contract or otherwise

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or from the security deposit or the proceeds of sale thereof if the security deposit is held in Government Securities, the same or a sufficient portion thereof shall in that case be sold for the purpose. All materials supplied to the contractor shall remain the absolute property of ASCDCL and shall not be removed from the site of the work and shall at all times be open to inspection by the Engineer-in-charge. Any such materials issued at cost but remained unused and in perfectly good condition at the time of completion or termination of the contract shall be returned to the ASCDCL, store if the Engineer-in-charge so required by a notice in writing given under his hand, but the contractor shall not be entitled to return any such material supplied to him as aforesaid but remaining unused by him or for any wastage in or, damage to any such materials. The contractor shall, however return all unused material at the time of completion, which was issued to him free of cost by the Engineer in charge and which has remained surplus with the contractor after accounting for the actual utilization of such material from the total quantity that was issued by the Engineer in charge. Cost of any material issued free of cost by the engineer and which has remained surplus with the Engineer from the contractor as mentioned in Schedule – ‘A’

*Storage of controlled material*

Clause 12 (A): All stores of materials such as cement, steel etc. supplied to the contractor by ASCDCL should be kept by the contractor in a separate store near the work site under lock and key and will be accessible for inspection by the ASCDCL or his agent at all the times.

*Works to be executed in accordance with specifications drawings*

Clause 13: The contractor shall execute the whole and every part of the work in the most substantial and workman like manner and both as regards materials and every other respect in strict order accordance. The contractor shall also conform 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 of the work, during office hours. The contractor will be entitled to receive one sets of contracts drawing and working drawings as well as one certified copy of the accepted tender along with the work order free of cost. Further, copies of the contract drawings and working drawings if requires by him shall supplied at the rate of ` 2000/- per set of contract drawings and ` 100/- per working drawing except where otherwise specified

*Alteration in*

Clause 14 : The Engineer-in-charge shall have power to make any

*specifications & designs not to invalidate*

alterations in or additions to the original specifications, drawing, design and instructions that may appear to him to be necessary or contracts, advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the Engineer-in-charge and such alterations shall not invalidate the contract and any additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the main work and at the same rates as are specified in the tender for the main work. And if the additional and altered work includes any class of work for which no rate is specified in this contract, then such class of work shall be carried out at the rates entered in the Schedule of Rates (As adopted by ASCDCL) with due consideration for leads and lifts involved for materials and labour or at the rates mutually agreed upon between the Engineer-in-charge and the contractor, whichever are lower

However, if the Engineer-in-charge is not empowered by ASCDCL to approve the rates of such additional or altered work then as far as possible he shall obtain prior approval to the changes and to the rates payable for such changes from competent authority of ASCDCL not entered in before ordering the Contractor to take up the alternation/ additional work. If the additional or altered work for which no rate is in the schedule or rates of the Division, is ordered to be carried out before the rates are agreed upon then the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the Engineer-in-charge of the rate which it is his intention to charge for such class of work, and if the Engineer-in-charge does not agree to this rate he shall by notice in writing be at liberty to cancel his order carry out such class of work and arrange to carry out in such manner as he may consider advisable provided always that if the contractor shall commence the work or incur any expenditure in regard thereto before the rates shall have been determined as lastly hereinbefore mentioned then in such case he shall only be entitled to be paid in respect of the work or incur any expenditure in regard there to before the rates shall have been determined as lastly hereinbefore mentioned then in such case he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-charge. In the event of a dispute the decision of the CEO will be final. Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority the alterations above referred to shall be within the scope of such designs, drawings and specifications appended to the tender.

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- Extension of time in consequences additions or alterations*
- The time limit for the completion of the work shall be extended in the proportion that the increase in its cost occasioned by alterations or additions bears to the cost of the original contract work and the certificate of the Engineer-in-charge as to such proportion shall be conclusive.
- No claim to any payment or compensation for alteration in or restriction of Work except specified in this clause*
- Clause 15:
- i. If at any time after the execution of the contract documents the engineer shall for any reason whatsoever (other than default on the of the contractor for which the ASCDCL is entitled to rescind the contract) desires that the whole or any part of the work specified in the tender should be suspended for any period of that the whole or part of the work should not be carried 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 to 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.
- ii. Where the total suspension of work ordered 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 for as it pertains to the unexecuted part of the work by giving a 10days prior notice in writing to the Engineer within 30days of the expiry of the said period of 90 days of such intention and requiring the Engineer to record the final measurements of the work already done and to pay final bill. Upon giving such notice the Contractor shall be deemed to have been discharged from his obligation 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.
- iii. Where the Engineer in-charge requires the Contractor to suspend the work for a period in excess of 30 days at any time or 60 days in the

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aggregate, the contractor shall be entitled to apply to the Engineer within 30 days of the resumption of work after such suspension for payment of compensation to the extent of peculiarly loss suffered by him in respect of working machinery rendered idle on the site or on the account of his having had to pay the salary or wages to 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 of any suspension whatsoever occasioned by unsatisfactory work or other default on his part. The decision of the Engineer- in -charge in this regard shall be final and conclusive against the Contractor.

iv. In the event of any total stoppage of work on notice from the Engineer under sub-clause in that behalf.

a) Withdrawal by the Contractor from the contractual obligation to complete the remaining un-executed work under sub-clause (2) on account of continued suspension of work for a period exceeding 90 days.

b) Curtailment in the quantity of item or items originally tendered on account of any alteration, omission or substitutions in the specifications, drawings, designs or instructions under Clause 14 where such curtailment exceeds 25% in quantity and the value of the quantity curtailed beyond 25% at the rates for the item specified in the tender is more than 5,000/- , it shall be open to the Contractor within 90 days from the service of-

i) the notice of stoppage of worker

ii) the notice of withdrawal from the contractual obligations under the contract on account of the continued suspension of worker iii) notice under Clause 14(i) resulting in such curtailment to produce to the Engineer satisfactory documentary evidence that he had purchased or agreed to purchase material for use in the contracted work before receipt by him of the notice of stoppage, suspension or curtailment and required the ASCDCL to take over on payment such material at the rates determined by the Engineer, provided, however, that such rates shall in no case exceed the rates at which the same was acquired by the Contractor. The ASCDCL shall thereafter take over the material so offered, provided the quantities offered are not in excess of the requirements of the unexecuted work as specified in the accepted tender and are of quality and specifications approved by the Engineer.

*No claim to compensation* Clause 15 A: The Contractor shall not be entitled to claim any compensation from ASCDCL for the loss suffered by him on account of delay by



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*on account of loss due to delay in supply of material by ASCDCL* ASCDCL in the supply of materials entered in Schedule 'A' where such delay is caused by.

- i) Difficulties relating to the supply of railway wagons.
- ii) Force majeure.
- iii) Act of God.
- iv) Act of enemies of the State or any other reasonable cause beyond the control of The ASCDCL.

In the case of such delay in the supply of materials, ASCDCL shall grant such extension of time for the completion of the works as shall appear to the ASCDCL to be reasonable in accordance with the circumstances of the case. The decision of the ASCDCL as to the extension of time shall be accepted as final by the Contractor.

*Time limit for unforeseen claims* Clause 16: Under no circumstances whatsoever shall the Contractor be entitled to any compensation from ASCDCL on any account unless the Contractor shall have submitted claim in writing to the Engineer-in-charge within one month of the case of such claim occurring.

*Action and compensation payable in case of bad work* Clause 17 : If at any time before the security deposit or any part of thereof is refunded to the Contractor it shall appear to the Engineer-in-charge or his subordinate –in-charge of the work that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of inferior quality, or that any materials or articles provided by him for the execution of the work are unsound or quality is inferior to that contracted for, or are otherwise not in accordance with the contract, it shall be lawful for the Engineer-in-charge to intimate this fact in writing to the Contractor and then notwithstanding the fact that the work, materials or articles complained of may have been inadvertently passed, certified and paid for, the Contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or in part, as the case may require or if so required shall remove the materials or articles at his own charge and cost and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in the written intimation aforesaid, the Contractor shall be liable to

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pay compensation at the rate of one percent on the amount of the estimate for everyday not exceeding 10 days during which the failure so continues and in the event of any such failure the Engineer-in-charge may rectify or remove and re execute the work or remove and replace the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor. Should the Engineer in charge consider that any such inferior work or materials as prescribed above may be accepted or made use of, it shall be within his discretion to accept the same at the reduced rates as he may fix therefore.

*Work to be open to inspection and Contractor or responsible agent to be present*

Clause 18: All work under or in course of execution or executed in pursuance of the contract shall at all times be open to inspection and supervision of the Engineer-in-charge and his subordinates and the Contractor shall at all times during the usual working hours, and at all other times at which reasonable notice of the intention of the Engineer-in-charge and his subordinates to visit the works shall have been given to the Contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for that purpose. Orders given to the Contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the Contractor himself.

*Notice to be given before work is covered up*

Clause 19 : The Contractor shall give not less than five days' notice in writing to the Engineer-in-charge or his subordinate in-charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or placed beyond the reach of measurement and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Engineer-in-charge or his subordinate in- charge of the work, and if any work shall be covered up or placed beyond the reach of measurement, without such notice having been given or consent obtained, the same shall be uncovered at the Contractor's expense, and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed.

*Contractor liable for damage done*

Clause 20 : If during the period as listed below, from the date of completion as certified by the Engineer-in-charge pursuant to Clause 7 of the Contract or for the period as mentioned below after commissioning the work

*and for imperfections* whichever is earlier in the opinion of the Engineer in-charge, the said work is defective in any manner whatsoever the contractor, shall forthwith on receipt of notice in that behalf from the ASCDCL, duly commence execution and completely carry out at his cost in every respect all the work that may be necessary for rectifying and setting right the defects specified therein including dismantling and reconstruction of unsafe portion strictly in accordance with and in the manner prescribed and under the supervision of the ASCDCL. In the event of the Contractor failing or neglecting to commence execution of the said rectification work within the period prescribed therefore in the said notice and/ or to complete the same as aforesaid as required by the same notice, the ASCDCL may get the same. Executed and carried out departmentally or by any other agency at the risk, on account and at the cost of the Contractor. The Contractor shall forthwith on demand pay to the ASCDCL the amount of such costs, charges and expenses sustained or incurred by the ASCDCL of which the certification of the ASCDCL shall be final and binding on the Contractor, Such costs, charges and expenses shall be deemed to be arrears of land revenue and in the event of the Contractor failing or neglecting to pay the same no demand as aforesaid without prejudice to any other rights and remedies of the ASCDCL, the same may be recovered from the Contractor as arrears of land revenue. The ASCDCL, shall also be entitled to deduct the same from any amount which may then be payable or which may thereafter become payable by the ASCDCL to the contractor either in respect of the said work or any other work whatsoever or from the amount of security deposit retained by the ASCDCL. During defect liability period, the work of daily maintenance and general repairs and expenses thereon would be out of scope of the tender. However, if any defects in the sub work or in the material are found, the same will be rectified by the Contractor at his cost and will be binding on him, failing to which legal action would be taken as per tender clauses. Ten percent amount will be withheld from security deposit depending upon the nature of work, till the defect liability period is over.

*Contractor to supply plant, ladders, scaffoldings, etc. And is liable for damages arising from non-provisions of lights, fencing,* Clause 21 : The Contractor shall supply at his own cost all material (except such special materials, if any, as may in accordance with the contract be supplied from the ASCDCL stores), plant, tools, appliances, implements, ladders, tackles, scaffolding and temporary works requisite or proper execution of the work, in the original, altered or substituted from the weather included in the specification or other documents forming part of the contract of referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer in charge as to any matter as to which under these conditions he is entitled to as satisfied or which he is entitled to require together with

*etc.* the carriage therefore to and from the work.

The Contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurement or examination at any time and from time to time of the work or the materials, failing which the same may be provided by the Engineer-in-charge at the expense of the Contractor and 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 a 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 costs which may be awarded in any such 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 costs which may be awarded in any such suit action or proceedings to any such person, or which may with consent of the Contractor be paid for compromising any claim by any such person.

*Liability of  
Contractors  
for any  
damage done  
in or outside  
the work area*

Clause 21 A: The Contractor shall provide suitable scaffolds and working platforms, gangways and stairways and shall comply with the following regulations in connection herewith.

a) Suitable scaffolds shall be provided for workmen for all works that cannot be safely done from a ladder or by other means.

b) A scaffold shall not be constructed, taken down or substantially allowed except i) under the supervision of a competent and responsible person, and ii) as far as possible by competent workers possessing adequate experience in this kind of work.

c) All scaffolds and appliances connected herewith and ladders shall; i) be of sound material, ii) be of adequate strength having regard to the loads and strains to which they will be subjected, and iii) be maintained in proper condition.

d) Scaffolds shall be so constructed that no part thereof can be displaced in consequence of normal use.

e) Scaffolds shall not be over – loaded and so far, as practicable the load in consequence of normal use.

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- f) Before installing lifting gear on scaffolds special precautions shall be taken to ensure the strength and stability of the scaffolds.
- g) Scaffolds shall be periodically inspected by a competent person.
- h) Before allowing a scaffold to be used by his workmen the Contractor shall whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulations herein specified.
- i) Working platform, gangway, stairways shall; i) be so constructed that no part thereof can sag unduly or unequally, ii) be so constructed and maintained, having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping, and iii) Be kept free from any unnecessary obstruction.
- j) In the case of working platform, gangways, working places and stairways at a height exceeding 2 meters.
- k) every working platform, gangways shall be closely boarded unless other adequate measures are taken to ensure safety,
- l) every working platform, gangway shall have adequate width, and
- m) every working platform, gangway, working place and stairway shall be provided with railing/ barricading
- n) Every opening in the floor of a building or in a working platform shall except for the time and to the extent required to allow the excess of persons or the transport or shifting of material be provided with suitable means to prevent the fall of persons or material.
- o) When persons are employed on a roof where there is a danger of falling from the height exceeding 3 meters suitable precautions shall be taken to prevent the fall of persons or material
- p) Suitable precautions shall be taken to prevent persons being struck by articles, which might fall from scaffolds or another working place
- q) Safe means of access shall be provided to all working platforms and other.
- r) The Contractor will have to make payments to labourers as per Minimum Wages Act.

Clause 21 B: The Contractor shall comply with the following regulations as

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*Employment  
of female  
labour work  
on Sunday*

regards the Hoisting appliances to be used by him.

a) Hoisting machines and tackles, including their attachments, anchorages and supports shall; i) be of good mechanical construction, sound material and adequate strength and free from patent defect, and ii) be kept in good repairs and in good working order.

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of suitable quality and adequate strength and free from patent defect.

c) Hoisting machines and shackles shall be examined and adequately tested after erection on the site and before use and be re-examined in position at intervals to be prescribed by the ASCDCL.

d) Every chain, ring, hook, shackle, swivel and pulley block used in hoisting or lowering materials or as means of suspension shall be periodically examined.

e) Every crane driver or hoisting appliance operator shall be properly qualified.

f) No person who is below the age of 18 years shall be in control of any hoisting machine, including any scaffold, which gives signals to the operator.

g) In case of every machine and every chain, ring, hook, Shackle, swivel and pulley block used in hoisting or lowering or as a means of suspension, the safe working load shall be ascertained by adequate means.

h) Every hoisting machine and all gear referred to in proceeding regulation shall be plainly marked with the safe working load.

i) In case of hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated.

j) No part of any hoisting machine or any gear referred to in regulation (g) above shall be loaded beyond the safe working load except for the purpose of testing.

k) Motors, gearing, transmissions, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards.

l) Hoisting appliances shall be provided with such means, which will reduce to minimum, and the risks of the accidental descend of load.

m) Adequate precaution shall be taken to reduce to a minimum the risk of

any part for any damage done in or outside the work.

*Measures for prevention of fire*

Clause 22: The Contractor shall not set fire to any standing jungle, trees, brushwood or grass without a written permission from the ASCDCL. When such permission is given and also in all cases when destroying, cut or dug up trees, brushwood, grass, etc. by fire, the Contractor shall take necessary measures 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.

*Liability of Contractor for any damage done in or outside work area.*

Clause 23 : Compensation for all damages done intentionally or unintentionally by Contractor's labour whether in or beyond the limits of the ASCDCL property including any damage caused by the spreading of fire mentioned Clause 22 shall be estimated by the Engineer-in-charge or such other officer as he may appoint and the estimate of the Engineer-in-charge subject to the decision of the CEO 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 damage in the manner prescribed in Clause 1 or deducted by the Engineer-in-charge from any sums that may be due or become due from ASCDCL to Contractor under this contract or otherwise.

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

Clause 24 and 25: Deleted

*Work not to be sublet. Contract may be rescinded and security deposit forfeited for subletting it without approval or for bribing a Public Officer*

Clause 26 : The contract shall not be assigned or sublet without the written approval of the Engineer-in-charge, and if the Contractor shall assign or sublet his contract or attempt to do so, or become insolvent or commence any proceedings to get himself adjudicated and insolvent or make any composition with his creditors or attempt so to do so or if bribe, gratuity, gift, loan, perquisite, reward of advantage, pecuniary or otherwise shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employment of ASCDCL in any 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

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*or if Contractor becomes insolvent* writing rescind the contract, and the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of ASCDCL and the same consequences shall ensue as if the contract had been rescinded under Clause 3 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work thereof actually performed under the contract.

*Sum payable by way of compensation to be considered as reasonable without reference to actual loss* Clause 27: 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 ASCDCL without reference to the actual loss or damage sustained, and whether any damage has or has not been sustained.

*Changes in the constitution of the firm to be notified* Clause 28: In the case of tender by partners, any change in the constitution of a firm shall be forthwith notified by the Contractor to the Engineer-in-charge for his information.

Clause 29: All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the CEO who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried out.

Clause 30: If the contractor is not satisfied with the order passed by the Engineer-in-Charge, the contractor may, within thirty days of receipt by him of any such order, appeal against it to the CEO who if convinced that prima facie, the contractor's claim rejected by Engineer-in-Charge is not frivolous and that there is some substance in the claim of the contractor as would merit a detailed examination in the claim of the contractor. The decision of the CEO shall be final and binding on the contractor and the Engineer-in-charge

*Directions and control of* Clause 30.1 : Except where otherwise specified in the contract and subject to the powers delegated to him by ASCDCL under the code, rules then in



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*the Engineer in charge* force, the decision of the CEO for the time being shall be final, conclusive and binding on all parties of the contract, upon all questions relating to the meaning of the specifications, designs, drawings and instruction hereinbefore mentioned and as to the quality of workmanship, or materials used on the work or as to any other question, claim, right, matter or thing whatsoever, in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders, or these conditions, or otherwise concerning the works, or the execution, or failure to execute the same, whether arising during the progress of work, or after the completion or abandonment thereof

Clause 30.2: The Contractor may within thirty days of receipt by him of any order passed by the Engineer-in-Charge as aforesaid appeal against it to the CEO with the contract work or project provided that.

a) The accepted value of the contract exceeds ` 10 lakhs (Ten lakhs)

b) Amount of claim is not less than ` 1.00 lakh ( One Lakh).

Clause 31: Deleted

*Lump sums in estimates* Clause 32 : When the estimate on which a tender is made includes lump sums in respect of parts of the work, the Contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for each item, or if the part of the work in question is not in the opinion of the engineer-in-charge capable of measurement, the Engineer-in-charge may at his discretion pay the lump sum amount entered in the estimate and the certificate in writing of the Engineer- in-charge shall be final and conclusive against the Contractor with regard to any sum or sums payable to him under the provisions of this clause.

*Action where no specifications* Clause 33: In the case of any class of work for which there is no such specification as is mentioned in Rule I of Form B-1, such work shall be carried out in accordance with the Divisional specifications and in the event of there being no Divisional specifications, the work shall be carried out in all respect in accordance with all instructions and requirements of the Engineer- in-charge.

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- Definition of Work* Clause 34: The expression ‘Work’ or ‘Works’ where used in these conditions, shall unless there be something in the subject or context repugnant to such construction, be construed to mean the work or works contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered, substituted or additional.
- Contractor’s percentage whether applied to net or gross amount of bill* Clause 35: The percentage referred to in the tender shall be deducted from/ added to the gross amount of the bill before deducting the value of any stock issued.
- Quarry fees and royalties* Clause 36: All quarry fees, royalties, octroi duties and ground rent for stacking materials, if any should be paid by Contractor, which will not be entitled to a refund of such charges from the ASCDCL.
- Compensation under Workmen’s Compensation Act* Clause 37: The Contractor shall be responsible for and shall pay any compensation to his workmen payable under the Workmen’s Compensation Act. 1923 (VIII of 1923), (hereinafter called the said Act) for injuries caused to the workmen. If such compensation is payable/ paid by the ASCDCL as principal under sub-section (1) of Section 12 of the said Act on behalf of the Contractor, it shall be recoverable by the ASCDCL from the Contractor under the sub- section (2) of the said section. Such compensation shall be recovered in the manner laid down in Clause 1 above.
- Clause 37 A: The Contractor shall be responsible for and shall pay the expenses of providing medical aid to any workman who may suffer a bodily injury as a result of an accident. If such expenses are incurred by ASCDCL, the same shall be recoverable from the Contractor forthwith and be deducted without prejudice to any other remedy of the ASCDCL from any amount

due or that may become due to the Contractor

Clause 37 B: The Contractor shall provide all necessary personal safety equipment and first aid apparatus available for the use of the persons employed on the site and shall maintain the same in condition suitable for immediate use at any time and shall comply with the following regulations in connection herewith.

a) The workers shall be required to use the equipment's so provided by the Contractor and the Contractor shall take adequate steps to ensure proper use of the equipment by those concerned

b) When work is carried on in proximity to any place where there is a risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps shall be taken for the prompt rescue of any person in danger.

c) Adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work.

Clause 37 C: The Contractor shall duly comply with the provisions of 'The Apprentices Act, 1961' (III of 1961), the rules made thereunder 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 subjected to all the liabilities and penalties provided by said Act and said Rules.

*Quantities put to tender are approximate. Excess quantity beyond quantity put to tender will be governed as per Cl.38*

Clause 38:

i) Quantities in respect of the several items shown in the tender are approximate and no revision in the tendered rate shall be permitted in respect of any of the items. Excess quantity shall be executed only after prior written permission of the ASCDCL and shall be paid at tendered rates only.

ii) The Contractor shall, if ordered in writing by the Engineer, also carry out any quantities in excess of the limit mentioned above in sub-clause (i) hereof on the same conditions and in accordance with the tendered rates

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only.

<i>Employment of famine labour, etc</i>	Clause 39: The Contractor shall employ any famine, convict or other labour of a particular kind or class if ordered in writing to do so by the Engineer-in-charge.
<i>Claim for compensation for delay in starting the work</i>	Clause 40: 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 works, on account of any delay in accordance to sanction of estimates.
<i>Claims for compensation for delay in execution of the work.</i>	Clause 41: No compensation shall be allowed for any delays in the execution of the work on account of water standing in borrow pits or compartments. The rates are inclusive for hard or cracked soil, execution in mud, sub-soil, water standing in borrow pits and no claim for an extra rate shall be entertained unless otherwise expressly specified
<i>Entering upon or commencing any portion of work</i>	Clause 42: The Contractor shall not enter upon or commence any portion of work except with written authority and instructions of the Engineer-in-charge of his subordinate in charge of the work. Failing such authority, the Contractor shall have no claim to ask for measurements of or payment for work.
<i>Minimum age of persons employed, the employment of donkeys and other animals and the payment of fair wages.</i>	Clause 43: i) No Contractor shall employ any person who is under the age of 18 years. ii) No Contractor shall employ donkeys or other animals with breaching of string or thin rope. The breaching must be at least three inches wide and should be of tape (Nawar). i. No animal suffering from sores, lameness or emaciation or which is immature shall be employed on the work. The Engineer-in-charge or his agent is authorized to remove from the work, any person or animal found working which does not satisfy these conditions and no responsibility shall be accepted by the ASCDCL for any delay caused in the completion of the

work by such removal.

ii. The Contractor shall pay fair and reasonable wages to the workmen employed by him in the contract undertaken by him, In the event of the dispute arising between the Contractor and his workmen on the grounds that the wages paid are not fair and reasonable, the dispute shall be referred without delay to the Engineer in charge who shall decide the same. The decision of the Engineer in charge shall be conclusive and binding on the Contractor but such decision shall not in any way affect the conditions in the contract regarding the payment to be made by the ASCDCL at the sanctioned tender rates.

iii. Contractor shall provide drinking water facilities to the workers. Similar amenities shall be provided to the workers engaged on large work in urban areas.

iv. Contractor to take precautions against accidents which taken place on account of labour using loose garments while working near machinery.

*Method of payment*

Clause 44: Payment to Contractors shall be made by cheque drawn on CEO's account provided the amount exceeds ` 1000/-. Amounts not exceeding 1000/- will be paid in cash.

*Acceptance of conditions compulsory before tendering for work.*

Clause 45: Any Contractor who does not accept these conditions shall not be allowed to tender for work.

*Employment of scarcity labour*

Clause 46 : If Government declares a site of scarcity or famine to exist in any village situated within 16 Kms of the work, the Contractor shall employ upon such parts of the work, as are suitable for unskilled labour, any person certified to him by the Engineer in charge ASCDCL, or by any person to whom the ASCDCL may have delegated this duty in writing to be in need on relief and shall be bound to pay to such person wages not below the minimum wages which Government may have fixed in this behalf. Any disputes which may arise in connection with the implementation of this clause shall be decided by the Engineer in charge whose decision shall be

final and binding on the Contractor.

*Price not to exceed controlled price fixed by Govt.* Clause 47: The price quoted by the Contractor shall not in any case exceed the control price, if any, fixed by Government or reasonable price which is permissible for him to charge a private purchaser for the same class and description, the control price or the price permissible under the provisions of Hoarding and Profiteering Preventing Ordinance, 1948 as amended from time to time. If the price quoted exceeds the controlled price or the price permissible under Hoarding and Profiteering Prevention Ordinance, the Contractor will specifically mention this fact in his tender along with the reasons for quoting such higher prices. The purchaser at his discretion will in such case exercise the right of revising the price at any stage so as to conform to the controlled price as permissible under the Hoarding and Profiteering Prevention Ordinance. This discretion will be exercised without prejudice to any other action that may be taken against the Contractor.

*Rate inclusive of all taxes except GST* Clause 47 A: The rates to be quoted by the contractor must be inclusive of all taxes except GST. No extra payment on this account will be made to the contractor. GST shall be paid separately by ASCDCL on the bills raised by the Contractor.

*GST on surplus material* Clause 48: In case of materials that may remain surplus with the Contractor from those issued, the date of ascertainment of the materials being surplus will be taken as the date of sale for the purpose of GST and the same including any other tax applicable will be recovered on such date.

Clause 49: Deleted

*Employment of local labour* Clause 50: The Contractor shall employ at least 80 percent of the total number of unskilled labour to be employed by him on the said work only from locally available labours and shall give preference to those persons enrolled under Maharashtra Government employment and self-Employment Department's Scheme. Provided, however, that if required number of unskilled labour from that district is not available, the Contractor shall in the first instance employ such number of persons as is available and thereafter may with the previous permission in writing of the Engineer-in charge of the

said work obtain the rest of the requirement of unskilled labour from outside of district.

*Wages to be paid to the skilled and unskilled labours employed by Contractor*

Clause 51: The Contractor shall pay the labourers – skilled and unskilled according to the wages prescribed by Minimum Wages Act applicable to the area in which the work of the Contractor is located. The Contractor shall comply with the provision of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time. The Contractor shall be liable for any pecuniary liability arising on account of any violation by him of the provisions of the Act. The Contractor shall pay the labourers – skilled and unskilled- according to wages prescribed

Clause 52: All amounts whatsoever which the Contractor is liable to pay to the ASCDCL in connection with the execution of the work including the amount payable in respect of

i) materials and/ or stores supplied/ issued hereunder by the ASCDCL to the Contractor,

ii) hire charges in respect of heavy plant, machinery and equipment given on hire by the ASCDCL to the Contractor for execution by him of the work and/ or for which advances have been given by the ASCDCL to the Contractor shall be deemed to be arrears of the land revenue and ASCDCL without prejudice to any other rights and remedies of the ASCDCL recover the same from the contractor as an arrears of land revenue.

Clause 53: The Contractor shall duly comply with all the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 (37 of 1970) and the Maharashtra Contract Labour (Regulation and Abolition) Rules 1971 as amended from time to time and all other relevant statutes and statutory provisions concerning payment of wages particularly to workmen employed by the contractor and working on the site of the work. In particular and contractor shall pay wages to each worker employed by him on the site of the work at the rates prescribed under the Maharashtra Contract Labour (Regulation and Abolition) Rules 1971. If the contractor fails or neglect to pay wages at the said rates or makes short payment and the ASCDCL makes such payment of wages in full or part thereof less paid by the contractor, as the case may be, the amount so paid by the ASCDCL to such workers shall be deemed to be debt payable by the Contractor and the ASCDCL shall be entitled to recover the same as such from the contractor or deduct same from

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the amount payable by the ASCDCL to the contractor hereunder or from any other amounts payable to him by the ASCDCL.

Clause 54: Where the work is required to work near Machine and are liable to accident, they should not be allowed to wear loose clothes like Dhoti, Jhabba etc.

Clause 55: Deleted

Clause 55A: The Contractor shall comply with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time. If he fails to do so, his failure will be breach of contract and the CEO may in his discretion to cancel the contract.

The Contractor shall also be liable to any penalty liability existing on account of the violation by him of the provisions of the Act.

Clause 55B: Contractor should note that recovery at penal rate of twice the issue rate will be effected if the contractor does not return the surplus material and the GST and transportation cost will also be recovered from him.

Clause 56: In view of the difficult position regarding the availability of the Foreign exchange, no foreign exchange, will be released by the Department for the purchase of the Plant and Machinery required for the execution for the work concerned work.

Clause 57 and 58: Deleted

*Anti-Malaria  
and other  
health  
measures*

Clause 58 (A): Conditions of Malaria Eradication.

a) The anti-malaria and the health measures shall be as directed by the Joint Director (Malaria and Filarial) of Health Service, Pune.

b) Contractor shall see that most autogenic conditions are not created so as to keep vector population to minimum level.



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c) Contractor shall carry out anti malaria measures in the area as per guidelines prescribed under National Malaria Eradication Programme and as directed by the Joint Director (M & F) of Health Services, Pune.

d) In case of default in carrying out prescribed anti malaria measures resulting in increase in malaria incidence contractor shall be liable to pay to Government the amount spent by Government on anti-malaria measures to control the situation in addition to fine.

e) Relations with Public Authorities. The contractor shall make sufficient arrangements for draining away the sullage water as well as water coming from the bathing and washing places and shall dispose of this water in such a way as not to cause, any nuisance. He shall also keep the premises clean by employing sufficient number of sweepers.

The contractor shall comply with all rules, regulations, bye-laws and directions given from time to time by any local or public authority in connection with this work and shall pay fees or charge which are leviable on him without any extra cost to Government.

Clause 58 (B): The successful contractor will have to enter into agreement in form specified by ASCDCL on a stamp of required amount as per rules in force. The stamp charges shall be borne by the contractor.

Clause 59: Deleted

### *Safety precautions*

Clause 60: The contractor shall provide and maintain barricades, guards, guard rails, temporary bridges and walkways, watchmen, headlights and danger signals illuminated from sunset to sunrise and all other necessary appliances and safeguards to protect the work, life, property, the public excavations, equipment and materials. Barricades shall be substantial construction and shall be painted such as to increase their visibility at night. For any accident arising out of the neglect of above instructions, the contractor shall be bound to bear the expenses of defense of every suit, action or other legal proceedings, at law, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay all damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid in compromising any claim by any such person.

*Insurance* Clause 61: The contractor shall take out necessary insurance policy /policies so as to provide adequate insurance cover for execution of the awarded work from the Director of insurance Maharashtra State. However if contractor desires to effect insurance with local office of any insurance company same should be under the Co- insurance-come- servicing arrangement approved by the director of insurance if the policy taken out by the contractor is not Co – Insurance basis (GIF- 60% and insurance company -40%) the same will not be accepted and the amount of the premium calculated by director of insurance will be recovered directly from the amount payable to the contractors for the executed contract work.

i. Loss of or damage to the Civil and Mechanical and Electrical equipment supplied/installed including the materials/brought onsite, Loss of or damage to contractor's equipment including his vehicles, Loss of or damage to property (except the works, Plant material and Equipment) in connection with the contractor, and: Personal injury or death due to vehicles of the contractor and or due to any accident that may arise at or around the site to the Contractor personnel or to the ASCDCL staff or to any other person not connected with ASCDCL.

ii. Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the date of actual starting of work. All such insurance shall provide for compensation to be payable in the types of proportions of currencies required to rectify the loss or damage incurred.

iii. If the contractor did not produce any of the policies and certificates required the Engineer may affect the Insurance for which the contractor should have produced the policies certificates and recover the premium it has paid from payment otherwise due to the contractor or, if no payments due to payment of the premiums shall be of debt due.

iv. Alternations to the terms of an insurance shall not be made without the approval of the Engineer.

v. The minimum insurance cover for loss damages to physical property, injury and death shall be 10% of the contract cost per occurrence with number of occurrences as 3(Three). After each occurrence the contractor shall pay additional premium necessary so as to keep the insurance police valid always till the defect liability period is over.

vi. No payment will be released to the contractor until the insurance coverage with the Govt. Insurance fund, Maharashtra State is provided and unless the proof of insurance coverage is produced by the Contractor to the

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Engineer-in-Charge.

Clause 62: During execution of work excavation is required to be carried out for various sub-works for which royalty is required is to be paid by the contractor.

During execution of work and till completion if point of royalty is raised by collector office it will be sole responsibility of the contractor to pay royalty charges/compensation if any to concerned. Until the certificate from the collector office regarding royalty charges is not submitted by the contractor, final bill and security deposit for such work will not be payable to the contractor.

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**SCHEDULE –A**

Statement showing the material to be supplied from the store for the work contracted to be executed and preliminary and ancillary works and the rate at which they are to be charged.

S. No.	Particulars of Material	Particulars of Material	Rate at which the material shall be charged for	Place of delivery
1	2	3	4	5
	NIL	NIL	NIL	NIL

Note: Other materials except as shown in Schedule ‘A’ required for the work shall be procured and supplied by the contractor at his cost. In such cases the test certificates for their quality shall have to be produced by the contractor and testing carried out as mentioned in appropriate sections.

**SCHEDULE –B**

(As uploaded separately on <https://mahatenders.gov.in> )

**Drawings**

(As uploaded separately on <https://mahatenders.gov.in> along with tender documents )