KOLKATA METRO RAIL CORPORATION LIMITED
EAST WEST METRO PROJECT

CONTRACT – ATWP

DESIGN, MANUFACTURE, SUPPLY, INSTALLATION, TESTING & COMMISSIONING AND TRAINING OF PERSONNEL OF AUTOMATIC TRAIN WASH PLANT FOR CENTRAL PARK DEPOT OF KOLKATA METRO RAIL CORPORATION LIMITED.

TENDER DOCUMENTS

1. Notice of Invitation to Tender
2. Initial Filter Criteria
3. Instructions to Tenderers
4. Form of Tender
5. Conditions of Contract
6. Special Conditions of Contract
7. Particular Specifications
8. Appendices
9. Annexure 1 to 9

KOLKATA METRO RAIL CORPORATION LIMITED
KMRCL Bhawan,
Munshi Premchand Sarani,
HRBC Office Complex
Kolkata 700 021
India

Date of Issue: 22nd February 2013
KOLKATA METRO RAIL CORPORATION LIMITED
EAST WEST METRO PROJECT

CONTRACT – ATWP

DESIGN, MANUFACTURE, SUPPLY, INSTALLATION,
TESTING & COMMISSIONING AND TRAINING OF
PERSONNEL OF AUTOMATIC TRAIN WASH PLANT FOR
CENTRAL PARK DEPOT OF KOLKATA METRO RAIL
CORPORATION LIMITED.

VOLUME 1

NOTICE OF INVITATION TO TENDER

KOLKATA METRO RAIL CORPORATION LIMITED
3rd Floor, KMRCL Bhawan,
HRBC Office Complex
Munshi Premchand Sarani,
Kolkata 700 021
India
Kolkata Metro Rail Corporation Limited

Our Ref: ___________________________ Date: ___________________________

TO ___________________________ FROM ___________________________

Managing Director
Kolkata Metro Rail Corporation Limited
3rd floor KMRCL Bhawan
Munshi Premchand Sarani
Kolkata-700 021, India

CONTRACT – ATWP

DESIGN, MANUFACTURE, SUPPLY, INSTALLATION, TESTING & COMMISSIONING AND TRAINING OF PERSONNEL OF AUTOMATIC TRAIN WASH PLANT FOR CENTRAL PARK DEPOT OF KOLKATA METRO RAIL CORPORATION LIMITED.

NOTICE OF INVITATION TO TENDER

1. GENERAL

2. Name of Work:


3. Key Details:

<table>
<thead>
<tr>
<th></th>
<th>INR 25000/- (Rs Twenty five Thousand only) or USD 500/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Tender Document</td>
<td></td>
</tr>
<tr>
<td>Tender Security Amount</td>
<td>INR 9,00,000/- (Rs Nine Lakh only or USD 18000)</td>
</tr>
<tr>
<td>Sale of Tender Document</td>
<td>22nd February to 8th March 2013 (between 11:00 hrs to 17:00 hrs) on working days</td>
</tr>
<tr>
<td>Completion Period of the Contract (Subject to the achievement of Key Dates)</td>
<td>47 weeks plus DLP</td>
</tr>
<tr>
<td>Last Date of Seeking Clarification</td>
<td>30th March 2013</td>
</tr>
<tr>
<td>Replies to Queries from Bidders</td>
<td>6th April 2013</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Date &amp; Time of Submission of Tender</td>
<td>11:00 to 12:00 hrs on 20th April 2013</td>
</tr>
<tr>
<td>Date &amp; Time of Opening of Tender</td>
<td>12:15 Hours on 20th April 2013</td>
</tr>
<tr>
<td>Validity of Tender</td>
<td>180 days from the latest Date of Submission of Tender</td>
</tr>
<tr>
<td>Authority and Place for Seeking Clarifications and Submission of Completed Tender Documents</td>
<td>Managing Director, Kolkata Metro Rail Corporation Ltd 3rd floor, KMRCL Bhawan Munshi Premchand Sarani, Kolkata-700 021, India.</td>
</tr>
</tbody>
</table>

4. The Tender Documents comprise 2 (Two) Volumes in respect of Contractual, Technical, Financial matters and related information, as follows:

**Volume 1**

- Notice of Invitation to Tenderer
- Initial Filter Criteria
- Instructions to the Tenderers (including Annexures)
- Form of Tender (including Appendices)
- Conditions of Contract
- Special Conditions of Contract
- Particular Specifications
- Appendices B to J
- Annexure 1 to 9

**Volume 2**

5. Appendix-A:- Schedule of Dimensions (SOD)

6. Tender Drawings

7. The tender documents are available on payment of a non-refundable fee of Rs. 25,000 or US$ 500 in the form of a cross Demand Draft issued from an Indian Schedule Bank (excluding Co-operative Banks) or from a Schedule Foreign Bank as defined in Section 2(e) of RBI Act 1934 read with Second Schedule drawn in favour of "Kolkata Metro Rail Corporation Limited" Payable at Kolkata, from:

The Managing Director,
Kolkata Metro Rail Corporation Ltd
3rd floor, KMRCL Bhawan
Munshi Premchand Sarani,
Kolkata-700 021, India.
8. Tenderers may also download tender document from website www.kmrc.in and submit the document duly filled in after taking print out through laser print only in A4 size paper. And marking the same as ‘Web Document’ using ‘Footer’. Master copy of the tender document is available in the KMRCL office. In case, any discrepancy between Tender document downloaded from the website and the master copy, latter shall prevail and binding on the Tenderers. No claim on this account will be entertained. Tenderers shall submit a crossed demand draft from nationalised bank or Schedule bank in India for an amount INR 25,000.00 (USD 500) in favour of “Kolkata Metro Rail Corporation Limited” payable at Kolkata along with tender document downloaded from website without which the tender will not be accepted and shall be returned to the Tenderer unopened. The said demand draft shall be put into a separate envelop super scribing “Demand Draft for the cost of the Tender Document” followed by the name of the Tender. The tender shall be submitted at the time, date and at the address given above.

9. Please note carefully the requirements for submitting Tenders and the date and time for submittal. Late or delayed Tenders will not be considered for evaluation and shall either not be received or returned unopened.

10. One set of tender document (hard copy) and one CD (soft copy) will be issued. The tenderers have to submit the tender document along with tender submittals, un-tampered, duly signed and stamped on each page along with the CD.

11. Tender shall be valid for a period as specified in ITT Clause T13.2 and shall be accompanied by a bank guarantee towards Tender security for an amount as specified in Key Details above.

12. The tender shall be signed so as to legally bind all partners jointly and severally and Tender shall be submitted with a copy of Joint Venture / Consortium agreement as in application forms providing the joint and several liabilities with respect to the Contract.

Date

The Managing Director,
Kolkata Metro Rail Corporation Ltd
3rd floor, KMRL Bhawan
Munshi Premchand Sarani,
Kolkata-700 021, India.
INITIAL FILTER CRITERIA
### INITIAL FILTER CRITERIA (Refer clause T4.0 of ITT)

#### (A) FILTER OF APPLICANTS — CHECKLIST

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Has the Applicant abandoned any work in the last ten (10) years?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Has the Applicant involved in two or more litigations in the concluded/ongoing contracts in the last ten (10) years?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Has the Applicant suffered bankruptcy / insolvency in the last ten(10) years?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Has the Applicant been debarred by Government of India/any state government in India/Central or State government undertaking as on the due date of submittal? (Bidder to furnish a specific under taking to effect)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Has any misleading information been given in this application?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Has the applicant certified that no agent / middleman has been or will be engaged or any agency commission been or will be paid?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Is the Net Worth of the applicant (to be obtained from Balance Sheets/ Appendix-J) in the immediate previous financial year as considered in the bidder's country of origin &quot;POSITIVE&quot;?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. Ten (10) years'/Last ten (10) years' means the period of last ten (10) years ending on 31st December 2012.

2. A "YES" answer to any question 1, 2, 3, 4, 5, will disqualify the Applicant.

3. A "NO" answer to question 6, 7 will disqualify the Applicant.

4. In the case of a Joint Venture/Consortium/, each Individual member must qualify individually in the 'Filter of Applicants — Check List' except item 7.

5. In the case of a Joint Venture/Consortium, each member shall submit the balance sheet and Appendix-J duly filled. Evaluation for the item No. 7 above will be done in totality (aggregate of the evaluation of each member) and not as individual member.

6. DEBARRED means that the applicant (applies to each member of JV/Consortium) has been blacklisted or debarred by Government of India/any state government in India/Central or State government undertaking from participating in the tenders for a notified period of time. Copy of the notification of such debarment shall be submitted in the bid.
By virtue of my signature below, I confirm and verify to my best knowledge and belief that the company represented by me for submitting bid against this tender is not DEBARRED as on the date of submission of bid.

SIGNATURE OF TENDERER

(To be signed by applicant and each member of the group)

Date ............................

Page 2 of 4
INITIAL FILTER CRITERIA (Refer clause T4.0 of ITT)

(B) ELIGIBILITY CRITERIA (Refer clause T4.0 of ITT)

1.0 The bidder or consortium/JV lead partner must be a proven manufacturer of AUTOMATIC TRAIN WASHING PLANT who must meet the following conditions on date of bid opening:

<table>
<thead>
<tr>
<th>Col</th>
<th>Conditions</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>The AUTOMATIC TRAIN WASHING PLANT of similar specifications, which the bidder/lead partner must have supplied &amp; commissioned in last five years ending on 31st December 2012.</td>
<td>7</td>
</tr>
<tr>
<td>ia</td>
<td>Out of 7 AUTOMATIC TRAIN WASHING PLANT, which the bidder/lead partner must have supplied &amp; commissioned minimum numbers of AUTOMATIC TRAIN WASHING PLANT that should be in operation outside the country of origin in last five years ending on 31st December 2012. The tenderer shall submit the complete information as per the enclosed Annexure 2.</td>
<td>5</td>
</tr>
<tr>
<td>ii</td>
<td>Out of the supplied AUTOMATIC TRAIN WASHING PLANT by the bidder/lead partner in the last five years i.e., ending on 31st December 2012. minimum number of AUTOMATIC TRAIN WASHING PLANT that should be in operation with satisfactory performance for a minimum period of 2 years after commissioning as on the date of opening of tender and supported by a recent performance certificate from clients. The tenderer shall attach the certificate from the clients for satisfactory operation of the machine. The certificate should not be older than 8 months on the date of opening of tender.</td>
<td>3</td>
</tr>
<tr>
<td>iia</td>
<td>Out of these 3 nos of AUTOMATIC TRAIN WASHING PLANT that should be in operation with satisfactory performance for a minimum period of 2 years after commissioning, minimum numbers of AUTOMATIC TRAIN WASHING PLANT that should be in operation outside the country of origin as on the date of opening of tender and supported by a recent performance certificates from clients, not older than 8 months on the date of opening of tender.</td>
<td>1</td>
</tr>
</tbody>
</table>

1.1. The manufacturing unit, where the AUTOMATIC TRAIN WASHING PLANT is proposed to be manufactured & supplied against this tender, should have experience of manufacturing of at least 7 AUTOMATIC TRAIN WASHING PLANT in last five years i.e ending on 31st December 2012., out of which at least 3 should have been working satisfactorily after commissioning for a minimum period of two years as on the date of opening of bids. The bidder shall give complete details to establish the credentials of the proposed manufacturing unit as mentioned herein.

2.0. If a joint venture or consortium submits the bid, then lead partner should meet the criteria at 1.0 (i, ia), (ii) & (iia) as above.

3.0. The bidder if located outside India shall have an Indian associate for defects liability period and post defects liability period obligations, who should have at least 2 years experience of
manufacturing the machines for railways/metros applications or of giving after-sales service for machines used in railways/metros or shall be RDSO/Railways approved vendors. In support of the above, relevant certificates from the respective clients should be submitted.

3.1 The lead partner shall be fully responsible for supply, installation, commissioning of the machine and training of engineers and also for coordinating maintenance and after sales service during DLP.

3.2 A firm can be a partner only in one joint venture or consortium. Bids submitted by joint ventures or consortium, including the same firm, as partners in more than one bid will be rejected.

The firm shall furnish a performance statement as per Annexure-2 attached giving the following information on AUTOMATIC TRAIN WASHING PLANT supplied by him during the last 5 years.

The technical offer of only those bidders who qualify the eligibility criteria as above shall be evaluated.

In the absence of above information as per ITT clause T4.0 of initial filter Criteria, the offer is liable to be treated as unresponsive and liable to be rejected.
INSTRUCTIONS TO TENDERERS
INSTRUCTIONS TO TENDERERS

T1.0 GENERAL INSTRUCTIONS

T1.1 MD/KMRCL invites tenders from established and reliable manufacturers for the supply as set forth in the "Particular specifications."

T1.2 The Tenderer shall bear all costs associated with the preparation and submission of its tender. All offers in the prescribed format at Annexure-1 should be submitted by the prescribed date and time fixed for the receipt of offers as set forth in the tender papers. Offers received after the stipulated time and date, are liable to be rejected.

T1.3 All information in the offer must be in English. Information in any other language must be accompanied by its authenticated translation in English. Failure to comply with this may render the offer liable to be rejected. In the event of any discrepancy between an offer in a language other than English and its English translation, the English translation will prevail.

T1.4 Notice of Invitation to Tender
Initial filter criteria.
Instructions to Tenderers
Form of Tender
Conditions of Contract
Special Conditions of Contracts
Particular specifications (Technical Specifications)
Annexures

In case of any conflict between the above documents the order of precedence will be as under:

1. Particular specifications
2. Special Conditions of Contract
3. Instruction to Tenderers along with annexures
4. Conditions of Contract
5. Tenderer’s offer

T1.5 Clarification of Tendering Documents; and Pre-Tender Meeting:

A prospective Tenderer requiring any clarification of the tendering documents may notify the Employer in writing or by cable (hereinafter, the term cable is deemed to include Electronic Data Interchange (EDI) or telefax). Similarly, if a Tenderer feels that any important provision in the documents will be unacceptable, such an issue should be raised at this stage. The Employer will respond in writing to any request for clarification or modification of the tendering documents that it receives no later than twenty-one (21) days prior to the deadline for submission of tenders prescribed by the Employer. Written copies of the Employer’s response (including an explanation of the query but not identification of its source) will be sent to all prospective tenderers that have received the tendering documents. Foreign tenderers are encouraged to associate any Indian firm/s as a partner in a Joint Venture or consortium.

T1.6 Amendment of Tendering Documents

At any time prior to the deadline for submission of tenders, the Employer may, for any reason, whether at its own initiative, or in response to a clarification requested by a prospective Tenderer, amend the tendering documents.
The amendment will be notified in writing or by cable to all prospective tenderers that have purchased the tendering documents and will be binding on them. Tenderers are required to immediately acknowledge receipt of any such amendment, and it will be assumed that the information contained therein will have been taken into account by the Tenderer in its tender and also submit Appendix -F

**T2.0 COMPLIANCE WITH PARTICULAR SPECIFICATION**

**T2.1** The stores offered should be in accordance with the stipulated specifications in "Particular specifications".

**T2.2** The tenderer shall indicate his compliance or otherwise against each clause and sub-clause of the particular specifications, ITT, COC, SCC. The tenderer shall, for this purpose, enclose a separate statement of deviations (Annexure-5, 6) indicating compliance or otherwise of each clause and sub-clause of specifications, which should invariably, be filled in (if there are no deviations, a nil statement should be submitted) and submitted along with the offer. Whenever the tenderer deviates from the provisions of a clause/sub-clause, he shall furnish his detailed justification for the same in the 'Remarks' column. Tenderer wishing to offer technical alternatives to the requirements of the tendering documents must first price the Employer’s design of the facilities as described in the tender document, and shall further provide all information necessary for a complete evaluation of the alternatives by the Employer, including drawings, design calculations, particular specifications, breakdown of prices, proposed installation methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated tenderer to the basic technical requirements may be considered by the employer.

**T3.0 INDIAN ASSOCIATE & HIS SERVICES/ FACILITIES IN INDIA**

**T3.1** The foreign tenderer shall include in his offer the name of the person of the firm who will be acting as his representative/associate company in India in respect of his offer. He shall also indicate the after sales service facilities which he or his representative/associate company have in India.

**T3.2** Foreign firms quoting direct against the inquiry and who want Indian Associates and/or servicing facilities in India should indicate in their offer the name of their Indian Associates or the representative they have for servicing in India.

**T3.3** Tenderers of foreign firms should furnish following particulars. Offers which do not comply are liable to be ignored. They are also required to complete the check List as per Annexure-8.

(i) The name and address of the local representative/associate company.

(ii) The precise relationship between the foreign manufacturer/principals and their Indian representative/Associates.

(iii) The mutual interest which the manufacturer/principal and the Indian representative/associates have in the business of each other.

(iv) Foreign Tenderer has to submit a certificate that bidder is not having any Commission Agent in India and no agency commission will be paid otherwise it shall be sufficient ground for rejecting of his offer. Indian Associate/representative should also mention Income tax permanent account number.
All services (including after sales) to be rendered by the agents / associates whether the general nature or relation to the particular contract and the Facilities / Infrastructure available with them for the same.

(v) Past performance.

T4.0 QUALIFYING REQUIREMENTS OF TENDERERS

Unless otherwise approved by the Employer, the tenders for this Contract will be considered only from those companies, corporation, partnerships, consortia and joint ventures who pass the qualifying criteria based on submissions with the tender. Technical bids of only such eligible tenderers will be evaluated. The qualifying requirement of the tenderers will be as mentioned in Initial Filter Criteria.

T5.0 TENDER SECURITY/EARNEST MONEY/TENDER GUARANTEE

T5.1 The Tenderer shall submit with his tender a Tender security for a sum specified in Notice of Invitation to Tender (NIT), in the form of a Bank Guarantee issued by an Indian Nationalised/Scheduled Commercial Bank/Foreign Bank in India as per the format given in Annexure-3. If the Tender is submitted by a Joint Venture, the Tender Security must be in the name of the Joint Venture. The Tender Security shall remain valid for a period of 28 days beyond the Tender Validity.

Any Tender not accompanied by acceptable Tender Security shall be rejected by the Employer, and the Tender shall be returned unopened.

T5.3 No interest will be payable by the Employer on the Earnest Money/Tender Security.

T5.4 The Tender Security shall be forfeited:

a) if the Tenderer withdraws his Tender during the period of Tender validity; or
b) if the Tenderer does not accept the correction of his Tender price, pursuant to Sub-clause T9.2 below; or
c) if the Tenderer fails to withdraw conditions, qualifications, deviations etc. proposed by him at the price of withdrawal given in his tender; or
d) if the successful Tenderer refuses or neglects to execute the Contract or fails to furnish the required Performance Guarantee within the time specified by the Employer.
T5.5 The Earnest Money of the successful tenderer will be returned after the Contract Performance Guarantee as required (clause C9.0 of the conditions of contract) is furnished.

T5.6 The Earnest Money of all unsuccessful tenderers will be returned by the Purchaser.

T5.7 Any tender not accompanied by Earnest Money in one of the approved forms given in clause T5.1 shall be summarily rejected.

T5.8 **Qualification of the Tenderer**

T5.9 The Tenderers to qualify for award of Contract shall submit a written power of attorney authorising the signatories of the tender to commit each member of the partnership, consortium or joint venture. In case of Foreign Partners, Power of Attorney(s) and Board Resolution confirming authority on the persons issuing the Power of Attorney for such actions, shall be submitted duly notarized by the notary public of country of origin and should be stamped by Embassy/High Commission. Tenderers from Member Countries of Hague convention may submit all these documents with "Apostille" stamp instead of Embassy.

Where the Tenderer comprises a consortium or joint venture, the Tenderer shall submit the following additional information to meet the criteria for eligibility:

T5.10 a. A Memorandum of Understanding/Consortium Agreement, comprising of all the members, shall be provided duly notarized by the notary public of country of origin and should be stamped by Embassy/High Commission. Tenderers from Member Countries of Hague convention may submit all these documents with "Apostille" stamp instead of Embassy.

b. Nomination of one of the members of the consortium or joint venture to be in-charge (Leader); and this authorisation shall be covered in the Power of Attorney signed by the legally authorised signatories of all members of consortium or joint venture;

c. Details of the intended percentage participation given by each member shall be provided and reconfirmed and expanded with complete details of the proposed division of responsibilities and corporate relationships among the individual members.

d. The partner in charge (Leader) shall be authorized to incur liabilities, receive payments (if provided for in MoU/Consortium Agreement) and receive instructions for and on behalf of any or all partners of the joint venture/consortium;

e. All partners of the joint venture/consortium shall be jointly and severally responsible for the execution of the Contract in accordance with the Contract terms.

T5.11 The Tenderer shall submit with his Tender full details of his ownership and control or, if the Tenderer is a partnership, joint venture or consortium, full details of ownership and control of each member thereof.
T5.12 Indian Tenderers, or Indian members of a partnership, joint venture or consortium shall submit, a certified copy of the last 3 years (including the latest Financial Year) income tax return, duly acknowledged by Income Tax department in the Technical Package.

T5.13 Each Tenderer (each member in the case of a partnership, joint venture or consortium) or any associate is required to confirm and declare with his Tender that no agent, middleman or any intermediary has been, or will be, engaged to provide any services, or any other item or work, related to the award and performance of this Contract. They will have to further confirm and declare in the submittal that no agency commission or any payment which may be construed as an agency commission has been, or will be, paid and that the tender price will not include any such amount. If the Employer subsequently finds to the contrary, the Employer reserves the right to declare the Tenderer as non-compliant, and declare any Contract if already awarded to the Tenderer to be null and void. Specific declaration to this effect exactly as per Appendix- I shall be submitted with the Technical Package.

T5.14 Canvassing or offer of an advantage or any other inducement by any person with a view to influencing acceptance of a Tender will be an offence under laws of India. Such action will result in the rejection of the Tender, in addition to other punitive measures.

T5.15 The Applicant (including all members of a joint venture) shall not be one of the following:

T5.16 A firm or an organization which has been engaged by the Employer to provide consulting services for the preparation related to procurement for or implementation of this project;

T5.17 Any association/affiliates (inclusive of parent firm) of a firm or an organization mentioned in sub-clause above.

T5.18 A firm or an organization who lends or temporarily seconds its personnel to firms or organizations which are engaged in consulting services for the preparation related to procurement for or implementation of the project, if the personnel would be involved in any capacity on the same project.

T5.19 One Tender per Tenderer

Each Tenderer shall submit only one tender. If a Tenderer submits a tender in his own name and at the same time participates and submits a tender as a member of a consortium/joint venture, both tenderers will be disqualified. However, a propulsion system supplier can participate either as a member of any JV/Consortium bidding for this tender or as a sub-contractor to other tenderer(s).

T5.20 Form of Tender

The Form of Tender shall be completed and signed by a duly authorised and empowered representative of the Tenderer. If the Tenderer comprises a consortium or a joint venture, the Form of Tender shall be signed by a duly authorised representative of each member or participant thereof. Signatures on the Form of Tender shall be witnessed and dated. Copies of relevant powers of attorney as indicated in the 'Note' to 'Form of Tender' shall be attached.

T6.0 SUBMISSION OF OFFERS
T6.1 All offers shall be either typed or written neatly in indelible ink.

This is a two packets global tender. Tenderer has to submit their offer in two different packets. One packet will be for technical bid and another packet will be for financial bid.

A. Technical bid will be opened on due date (as per Notice for Invitation of Tender). This packet must contain

1) Tender Security (EMD) in original,
2) Technical bid
3) Documents related to qualifying requirement of the tenderer.
   a. Letter of Application
   b. Letter of participation from each member of the group
4) Form of Tender (with Power of Attorneys but without Appendices).
5) Contract conditions.
6) The Structure of the Tenderer including details of ownership and control of the Tenderer (See clause T5.1 of ITT) Appendix-E.
7) Certificate confirming receipt of all Tender Addenda as per proforma as given in Appendix F.
8) List of Technical and Commercial Deviations (if any) as per format given in Annexure- 5 (a) & Annexure-6 (a) along with the Undertaking that all the deviations have been listed and priced in the financial offer and Deviations not priced will be treated as Null and Void.
9) Cost of tender document in the currency as indicated in NIT.
10) Copy of all documents of Financial Package with Prices left blank. If any change is found in the unpriced document submitted along with the technical bid and in the priced financial offer then offer is liable to be rejected.
11) Certificate from the tenderer that all the contents of the Tender Documents have been carefully examined by the tenderer and all the pages of tenderer's proposal have been signed and stamped as per pro-forma as given in Appendix-G.
12) One set of complete Tender documents (including all Addenda), signed and stamped on right hand bottom corner of each page.
13) Any further documents which are requested in writing by Employer before submission of the Tender by way of evaluation documents but which are not to form part of the Contract.

B. Financial bid will be in the separate sealed envelope, which will contain

1) Price bid as per format of the Tenderers financial offers as given in tender document as Annexure- 1 (a) & (b) for KMRLs requirement.
2) Priced Technical and Commercial Deviations (if any) as per format given in Annexure 5 (b), 5 (c) & 6 (b) along with the undertaking that all the Deviations have been listed and priced in the financial proposal and deviations not priced will be treated as Null and void.
3) Financial bid will be opened in the presence of bidder only when tenderer's bid qualifies technically and in case tenderer's bid disqualifies technically, tenderers financial bid will be returned in sealed intact condition.
Tenderer has to submit their offer in two copies (one in original copy and another in duplicate copy) for the convenience of purchaser in evaluation. However, if the bid is submitted in one copy only, this will not become the basis of disqualification of the offer.

T6.2 Any individuals signing the tender or other documents connected therein should specify whether he is signing:

(i) as sole proprietor of the concern or as attorney of the sole proprietor;

(ii) as a partner or partners of the firm;

(iii) as a Director, Manager or Secretary in the case of a limited company duly authorized by a resolution passed by the board of directors or in pursuance of the authority conferred by Memorandum of Association.

T6.3 The original power of attorney or other documents empowering the individual or individuals to sign should be furnished to the Purchaser for verification, if required.

T6.4 All prices and other information like discounts etc. having a bearing on the price shall be written both in figures and words in the prescribed offer form.

T6.5.1 The Tenderer shall seal the Original and Copy of the two parts of his Tender into separate envelopes, duly marking the envelopes as "ORIGINALTENDER" and "Copy" and clearly state the contents of each with either 'Part A) Technical and Commercial' or 'Part B) Financial' as appropriate. The envelopes shall then be sealed in an outer envelope.

T6.5.2 The inner and outer envelopes shall

(a) be addressed to the KMRCL at the address given in the Invitation of Tender, and

(b) bear the Contract name indicated in the Invitation of Tender and the statement "Do NOT OPEN BEFORE [date and time]," to be completed with the time and date specified in the Invitation of Tender.

T6.5.3 The inner envelopes shall also indicate the name and address of the Tenderer so that the Tender can be returned unopened in case it is declared "late."

T6.5.4 If the outer envelope is not sealed and marked as required by ITT Sub-Clause T6.5.2 above, the Employer will assume no responsibility for the tenders misplacement or premature opening. If the outer envelope discloses the Tenderer's identity, then KMRCL will not guarantee the anonymity of the Tender submission, but this disclosure will not constitute grounds for Tender rejection.

T6.6 Offers shall be as per the Particular Specifications, Instruction to Tenderers and "Conditions of Contract", Special condition of contracts given in the Tender documents. However the tenderer shall indicate his acceptance or otherwise against each clause and sub clause of the Particular Specifications, Instruction to Tenderers and "Conditions of Contract", Special condition of contracts. For this purpose, the tender shall enclose a separate statement (Annexure 5, 6) indicating only the deviations from any clause or sub clause of the Particular Specifications, Instruction to Tenderers and "Conditions of Contract", Special condition of contracts, which he proposes with full justification for such deviations. All deviations from the tender documents, remarks, comments etc. shall be included in the Statement of Deviations (Schedule-II). The price of unqualified and unconditional withdrawal of all the conditions, qualifications, deviations etc. as mentioned in (Schedule-II) shall be quoted by the tenderer in the format given in Schedule-III. All implicit and explicit deviations, remarks and comments mentioned
elsewhere in the tenderer’s proposal shall be treated as NULL and VOID and considered withdrawn unconditionally. Any clause included in the Statement of Deviations (Schedule-II) but not priced in the Schedule-III, shall be treated as NULL and VOID and will be considered unconditionally withdrawn.

- The Tenderer shall provide a valid and fully compliant proposal for the cars as detailed in the Employer’s Requirements. The Tenderer shall submit a detailed clause by clause commentary on all the clauses of the Employer’s Requirements.
- Tenderers shall note that their comments to the clause by clause commentary wherever given shall only be in the following form:
  - Complied: “Complied” shall be indicated by the tenderer where the tenderer is able to comply fully with the clause.
  - Noted: Where a clause merely provides information, and no other comment is necessary, “Noted” will suffice.
  - Not Complied: Where the tenderer is not able to comply fully with the clause or has any observation or proposes an alternative design, “Not Complied” shall be indicated and comments if any of the tenderer shall be indicated in detail. All Clauses with status as “Not Complied” shall be included in the statement of Deviations Schedule-II and shall be priced in Schedule-III.
- Tenderer shall also note that:
  - Any comment by the tenderer in the Clause By Clause Commentary, other than either of “Complied”, “Noted” or “Not Complied” shall be treated as "Not Complied". Unless tenderer prices against such clauses in the Schedule-III, the comment against any clause shall be deemed to have been unconditionally withdrawn with no financial implications and shall be considered as NULL and VOID.
  - Any “Not Complied” comment by the tenderer in the Clause By Clause Commentary which has not been included in the Statement of Deviations Schedule-II shall be treated as “Complied”.
  - Any “Not Complied” comment by the tenderer in the Clause By Clause Commentary which has also been included in the Statement of Deviations Schedule-II but has not been priced in Schedule-III shall be treated as null and void and deemed to have been unconditionally withdrawn.
  - In case price for unqualified withdrawal of any remark, comment, condition, qualification or deviation etc. indicated in Schedule-II is not quoted in Schedule-III, it shall be considered that the remark, comment, condition, qualification or deviation is unconditionally withdrawn without any financial implication. However, Employer at its sole discretion and option may assess the financial implication of the said remark, comment, condition, qualification or deviation etc. based on best engineering principles and concepts, which shall be binding on the tenderer, and the same may be considered by Employer for financial evaluation.
  - A tender without a Clause by Clause Commentary, as stated above, is liable to be rejected.

The Purchaser, however reserves the right to accept or reject these deviations and his decision thereon shall be final.

**T6.7** Offers are required from the actual manufacturers of the stores or their authorized agents, who should submit a letter of authority from their Principals as in annexure-4.

**T6.8** Each page of the offer must be numbered consecutively, should bear the tender number and should be signed by the tenderer at the bottom. A reference to the total number of pages comprising the offer must be made at the top right hand corner of the first page.
The tenderer should avoid ambiguity in his offer e.g. if his offer to his standard sizes, lengths dimensions, he should specifically state them in details without any ambiguity. Brief descriptions such as ‘standard lengths’ etc. should be avoided in the offer.

(a) Tenderer shall give a breakdown of the prices in the manner and details called in for statement of prices as given in Annexure-1.

**T7.0 PRICE BASIS AND INDEMNITY**

T7.1 Foreign tenderer shall quote his prices on the basis of FOB nearest port of shipment having facilities to handle the same and also quote the Sea freight & inland haulage charges up to port of discharge as mentioned in statement of prices for supply from abroad. During the validity of Contract purchaser can convert purchase order on C&F basis. Foreign offers received without indicating the sea freight & in-land haulage charges will be loaded either with highest freight element received against the tender to arrive at same platform for evaluation or as determined by KMRCL based on quote received from Ministry of Surface Transport of Govt. of India/other reputed freight forwarders.

T7.2 The terms FOB & C&F etc shall be governed by the rules prescribed in the current edition of INCOTERM 2011, published by international chamber of commerce, 38 Cours Albert 1st, 75008 Paris, France.

T7.3 Prices should not include any type of agency commission payable to Indian Associate/Representatives. If it is established that any amount of agency commission is being paid to any associate/representative in India, if will be sufficient ground for rejection of offers.

T7.4 Currency of Payment

The Prices shall be quoted by the Tenderer separately in the following currencies:

(a) For inputs to the Works, which are expected to be supplied from within India, in Indian Rupees.

(b) For those inputs to the Works, which are expected to be supplied from outside India, in freely tradable foreign currencies.

(c) Maximum Number of currencies of payment shall not be more than three. The contract price will be paid in the contracted currency or currencies.

T7.5 The prices quoted shall be firm and not subject to any variation.

**T8.0 INSURANCE**

T8.1 All risk cover marine insurance shall be arranged by the Purchaser in case of import of equipment/stores on FOB or C&F basis.

T8.2 In the case of indigenous offers, purchaser shall not arrange for any transit insurance and the supplier will be responsible till the entire stores contracted for arrive in good condition in destination. Where the tenderer intends to insure the goods, he may arrange for it himself and pay insurance charges. The consignee shall advise the contractor within 45 (forty five) days of the arrival of goods and it shall be responsibility of the contractor to lodge the necessary claim on the carrier and or insurer and pursue the same. The tenderer shall, however at his own cost replace/rectify the goods lost/damage to the entire satisfaction of the consignee within 30 days from the date of receipt of intimation from the consignee, without waiting for the settlement of the claim.
T8.3 Clarification of Tenders

To assist in the examination, evaluation and comparison of tenders, the Employer may, at his discretion, ask any tenderer for clarification of his tender. The request for clarification and the response shall be in writing or by facsimile, but no change in the price or substance of the tender shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the tenders in accordance with clause T9.2.

T9.0 OPENING OF TENDERS

T9.1 Opening and Evaluation of Technical Tenders

i. KMRCL will open the Tenders, including "Withdrawals" and "Modifications" in the presence of Tenderers' designated representatives who choose to attend, at the time, date, and location as stipulated. All Tenderers or their Representatives must bring with them an authority letter on the letterhead of the Tenderer or their Indian Agent (as the case may be) duly signed by Competent Authority to attend the Tender opening. Failing to which they will not be allowed to attend the opening of the Tenders at KMRCL, Kolkata.

ii. Envelopes marked "WITHDRAWAL" shall be opened first and the name of the Tenderer shall be read out. Tenders for which an acceptable notice of Withdrawal has been submitted shall not be opened.

iii. Subsequently, all envelopes marked "MODIFICATION" shall be opened and the submissions therein read out in appropriate detail. No Tender shall be rejected at Tender opening except for late Tenders.

iv. KMRCL shall read out and prepare a record of the tender opening that shall include as a minimum: Tenderers' names, Tender Modifications and Withdrawals, the presence (or absence) of Tender Security, and any such other details as the KMRCL may consider appropriate, will be announced by the KMRCL at the opening.

v. Tenders not opened and read out at Tender opening shall not be considered further for evaluation, irrespective of the circumstances.

vi. First Technical Tenders will be opened and examined as per qualifying Criteria of the tender document as mentioned in clause T4.0 and as per Particular specifications of the Tender Documents and Financial Tenders will only be opened of those Tenderers, who will qualify in the Technical Tenders in case of two packet system (technical bid & financial bid).

vii. KMRCL will examine the Tenders to determine whether they are complete, whether the required technical submissions have been included, whether required Securities have been furnished, whether the documents have been properly signed, and whether the tenders are generally in order.

viii. Prior to the detailed evaluation, the KMRCL will determine whether each Tender is of acceptable quality, is complete and is substantially responsive to the Tender Documents. For purposes of this determination, a substantially
responsive Tender is one that conforms to all the terms, conditions and specifications of the Tender Documents without material deviations, objections, qualifications or reservations. A material deviation, objection, qualification or reservation is one (i) that affects in any substantial way the scope, quality or performance of the Contract; (ii) that limits in any substantial way, inconsistent with the Tender Documents, the KMRCL's rights or the successful Tenderers obligations under the contract; or (iii) whose rectification would unfairly affect the competitive position of other Tenderers who are presenting substantially responsive Tenders.

ix. If a Tender is not substantially responsive, it will be rejected and may not subsequently be made responsive by the Tenderer by correction of the nonconformity. The determination of a Tender's responsiveness is to be based on the contents of the tender itself without recourse to extrinsic evidence.

x. The KMRCL will carry out a detailed evaluation of the tenders previously determined to be substantially responsive in order to determine whether the technical and commercial aspects including qualifying criteria are in accordance with the requirements set forth in the Tender Documents. In order to reach such a determination, the Employer will examine commercial aspects including qualifying criteria and compare the technical aspects of the Tenders on the basis of the information supplied by the Tenderers, taking into account but not limited to the following factors:

a) overall completeness and compliance with the Instruction to Tenderers, Conditions of contract, Particular specifications and Drawings;

b) deviations from the Particular Specifications and commercial conditions as identified in Annexure 5 & 6 and those deviations not so identified; suitability of the Facilities offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the Tender. The bid that does not meet minimum acceptable standards of completeness, consistency and detail will be rejected for non-responsiveness.

c) achievement of specified performance criteria by the facilities

d) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services.

e) compliance with the time schedule provided in the Tender;

f) any other relevant factors, if any, listed in the Tender document, or that the KMRCL deems necessary or prudent to take into consideration.

**T9.2 Opening and Preliminary Examination of Financial Tenders**

i. In case of tenders have been invited in two packet system (technical bid & financial bid) the date, time and place of opening of Financial Tenders will be advised to the Tenderers whose Technical and Commercial offers have been found acceptable, so that they can be present at the time of opening of the Financial tenders. The tenderer is to note that the Financial Tender of the
Tender submissions for which the Technical and Commercial offer has satisfied as per requirement of the Tender only, will be opened.

ii. KMRCL shall read out and prepare a record of the Tender opening that shall include, as a minimum: the name of the Tenderer and whether there is a Withdrawal, Substitution, or Modification; the Tender Price; including any discounts. The Tenderer's representatives who are present shall be requested to sign the record. The omission of a Tenderer's signature on the record shall not invalidate the contents and effect of the record.

iii. The KMRCL will examine the Tenders to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the Documents have been properly signed, and whether the tenders are generally in order.

a. Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity, or between subtotals and the total price, the unit or subtotal price shall prevail, and the total price shall be corrected. If there is a discrepancy between words and figures, the amount in words will prevail. If the Tenderer does not accept the correction of errors, its Tender will be rejected and EMD/Tender Security will be forfeited.

b. KMRCL may waive any minor informality, nonconformity or irregularity in a Tender that does not constitute a material deviation, whether or not identified by the Tenderer in Annexure 5, 6 to its tender, and that does not prejudice or affect the evaluation of any Tenderer as a result of the technical and commercial evaluation.

T9.3 Tenders shall be deemed to be under consideration immediately after they are opened and until such time the official intimation of Award of Contract is made by the KMRCL to the Tenderer. While the Tenders are under such consideration, Tenderers and or their Representatives or other interested parties are advised to refrain from contacting the KMRCL by any means. If necessary, the KMRCL will obtain clarifications on the offers by requesting for such information from any or all the Tenderers, in writing by mail/fax/letter, as may be considered necessary. Tenderers will not be permitted to change the substance of their Tenders after they have been opened.

T9.4 During Tender evaluation, the KMRCL/Employer may, at its discretion, ask the Tenderer for a clarification of its Tender. The request for clarification and the response shall be in writing, and no change in the price or substance of the Tender shall be sought, offered or permitted.

T9.5 The Tenders received will be evaluated by the KMRCL to ascertain the substantially responsive, qualification and lowest Tender in the interest of the Employer, as specified in the specification and Tender Documents.

T10.0 EVALUATION OF THE OFFERS

T10.1 In case of tenders have been invited in two packet systems (technical bids & financial bids) financial Tender will be opened in the presence of all qualified Tenderers only when Tenderer's Tenders qualifies technically and in case tenderer's Tender disqualifies technically, Tenderers Financial Tenders will be returned in sealed intact condition as unopened.

T10.2 The lowest acceptance tenderer will be evaluated by the purchaser in accordance with the terms and conditions of this tender specification. Evaluation criteria
not mentioned herein but mentioned specifically in the particular specifications will be taken into consideration in the evaluation of offers.

T10.3 Purchaser will convert all tender prices expressed in the amount in various currencies in the tender prices as payable, to the local currency of Purchaser's country at the B.o selling market exchange rate established by State Bank of India on the due date of tender submittal. If there will be a bank holiday on the date of tender opening then Rate of Exchange will be taken on the day of previous working day of the bank.

T10.4 Also if a tenderer request for a variation in the payment terms stipulated in Conditions of Contract and if such variation is acceptable to the Purchaser, the same would be evaluated at an interest rate of 12% per annum for all earlier payments for the purpose of comparison with other tenderers offers.

T10.5 The quotations from indigenous tenderers are required for delivery FOR destination indicating the break-up of prices upto FOR final destination basis as mentioned in Annexure- 1 (statement of prices for supply within India). Foreign tenderers will quote their rates as per Annexure- 1 (statement of prices for supply from abroad).

T10.6 The offers received from indigenous tenderers should indicate clearly the rate/amount of ED, CST/ST etc. as leviable on particular item. In case concessional duty or taxes are applicable, the tenderer should quote accordingly. However, if the tenderer state in his offer that ED, CST/ST etc. will be charged as prevailing at the time of supply, then while working out F.O.R destination rates for comparison, the highest rate as applicable on the due date of submittal of tender will be loaded on the offer. Similarly, if concessional rate of ED, CST/ST or any other levy is applicable due to lower turnover or otherwise, the highest applicable rate on the due date of submittal of tender will be taken for the evaluation of F.O.R destination rates unless the tenderer confirms in the offer that any increase in the ED, CST/ST or any other levy due to increase in the turnover will be absorbed by the tenderer itself.

T10.7 i. Evaluation of offers shall be done on the submitted package by the bidders.

ii. For overseas supply for Package, evaluation of offers will be done on CIF + 1% landing charges + concessional rate of total Custom duty (including ACD, CVD & CESS etc.) on project import +service tax if any as applicable on the due date of tender submittal. Insurance charges will be loaded @ 0.25% of C&F value. 1% landing charges are meant for loading of custom clearance charges & inland transport upto final destination.

iii. For indigenous supply, tenderer shall quote their rates on final destination basis. Evaluation of offers will be made on FOR destination incl. of all taxes and duties.

T10.8 Service tax if any applicable on the services should be clearly mentioned in the price schedule (Annexure- 1). Offers will be evaluated including of service tax if any. If any bidder does not mention the applicable service tax if any then it will be consider that their prices are inclusive of service tax if any as applicable on due date of submittal of tender.
In case of foreign offer, if the service provider does not have permanent establishment in India and do not quote the service tax, the applicable service tax has to be deposited by the service receiver (purchaser) on reverse charge basis. Therefore, the service tax on service portion on the foreign offers will be considered inclusive in the quoted rates as applicable on the due date of submittal of tender. In this case, payment will be made after deducting the service tax that will be paid by service receiver (purchaser).

T10.9 Other terms and conditions for evaluation of financial offers will be as mentioned in Special Conditions of Contract.

T11.0 HIGHER PRICE FOR EARLIER DELIVERY

It should be noted that if a contract is placed on a higher tender as a result of this invitation to tender, the preference to the lowest acceptable offer in consideration of offer of earlier delivery, the Contractor will be liable to pay to the government the difference between the contract rate and that of the lowest acceptable tender on the basis of final price F.O.R. destination including all elements of freight, sales tax, local taxes, duties and other incidentals in case of failure to complete supplies in terms of such contract within the date of delivery specified in the tender and incorporated in the contract. This in addition and without prejudice to other rights under the terms of contract.

T12.0 ACCEPTANCE OF TENDER

T12.1 The purchaser may accept a tender for all the packages or for a complete package (package shall not be splitted), reject any tender without assigning any reason and may not accept the lowest or any tender. Acceptance of the tender shall be for a complete package.

T12.2 The Purchaser reserves the right to increase the quantity up to 25% of the quantity offered by the successful tenderer. The contractor is bound to accept the increase or decrease in the tendered quantity up to 25% under this clause as ordered at the time of placement of contract and/or during the currency of the contract. Purchaser may increase the qty. beyond 25% at the same rate. However, the purchaser reserves the right to operate the increase in qty. beyond 25% at its sole discretion. While operating this clause the quantity shall be rounded off to the next whole no.

T12.3 Acceptance of tender will be communicated by Cable, Telex, Telegram, Express Letter or formal acceptance of tender. In case where acceptance is indicated by Cable, Telex, Telegram or Express Letter, formal acceptance of tender will be forwarded to the Contractor as soon as possible, but the Cable, Telex, Telegram, Express Letter should be deemed to conclude the contract. Date of issue of Letter of Acceptance for the contract shall be the Commencement date of the Contract.

T12.4 SIGNING OF AGREEMENT

The Tenderer should note that in the event of acceptance of the Tender by the Employer, the Tenderer will be required to execute the Contract Agreement with the Employer within a period of 45 days from the date of issue of the Letter of Acceptance.

T13.0 EFFECT AND VALIDITY OF OFFER

T13.1 The submission of any offer connected with these specifications and documents shall constitute an agreement that the tenderer shall have no cause of action and claim, against the Purchaser for rejection of offer. The Purchaser shall always be at liberty to reject or accept any offer or offers at his sole discretion and any such action will not be called into question and the tenderer shall have no claim in that regard against the Purchaser.
T13.2 Tender shall be valid for a period of 180 days from the latest Date of Submission of Tenders. In exceptional circumstances, prior to expiry of the original tender validity period, the Employer may request that the Tenderers extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing, by facsimile or email (from delegated personnel). A Tenderer may refuse the request without forfeiting his Tender Security. A Tenderer agreeing to the request will not be required or permitted to modify his Tender, but will be required to extend the validity of his Tender Security for the period of the extension.

Only one communication either extending the validity or refusing to extend the validity would be entertained. If the validity is not extended, no further representation, if any, to revive the tender at a later date will be entertained.

T13.3 Offers shall be deemed to be under consideration immediately after they are opened and until such time the official intimation of award of contract is made by the Purchaser to the Tenderer. While the offers are under such consideration, tenderers and or their representatives or other interested parties are advised to refrain from contacting the Purchaser by any means. If necessary, the Purchaser will obtain clarifications on the offers by requesting for such information from any or all the tenderers, either in writing or through personal contacts, as may be considered necessary. Tenderers will not be permitted to change the substance of their offers the-offers have been opened.

T14.0 GENERAL

T14.1 The tenderers must ensure that the conditions laid down for submission of offers detailed in the preceding paragraphs, are completely and correctly fulfilled. Offers, which are not complete in all respects as stipulated above, may be summarily rejected. For tenders guidance in submitting complete offers, a check List has been enclosed with the tender in clause no of Annexure -8 which must be filled in and furnished with the tender.

T15.0 LAST DATE OF RECEIPT OF TENDERS

T15.1 The offers complete in all respects should reach the Kolkata Metro Rail Corporation Ltd, Kolkata, INDIA, not later than the time and date as specified in the "NIT".

T16.0 CHECK LIST

T16.1 A check List has been included at Annexure-8 of this document. This has been designed to help the tenderers in submitting complete offers. An incomplete offer is liable to be rejected.

The tenderers must fill the Check List & submit along with their offer in their own interest.

Kolkata Metro Rail Corporation Ltd.
3rd Floor, KMRCL Bhawan, Munshi Premchand sarani, Kolkata-700021.
FORM OF TENDER
FORM OF TENDER

To
Managing Director
Kolkata Metro Rail Corporation Limited,
3rd floor KMRCL Bhawan,
Munshi Premchand Sarani,
Kolkata-700021, India

DESIGN, MANUFACTURE, SUPPLY, INSTALLATION, TESTING & COMMISSIONING AND TRAINING OF AUTOMATIC TRAIN WASH PLANT

TENDER GENTLEMEN,


2. We undertake [jointly and severally] to complete and deliver the whole of the Works and achieve all Stages, within the times stated in 'Appendix -H hereto.

3. We undertake [jointly and severally]:
   a. to keep this Tender open for acceptance without unilaterally varying or amending its terms for the period stated in Notice of Invitation to Tender hereto [(the withdrawal of any member or any other change in the composition of the partnership/joint venture/consortium on whose behalf this Tender is submitted shall constitute a breach of this undertaking)]*; and
   b. if this Tender is accepted, to provide Guarantees, Undertakings & Warranties for the due performance of the Contract as stipulated in the Conditions of Contract, Special Conditions of Contract and 'Appendix-H' hereto; and
   c. to hold in confidence all documents and information whether technical or commercial supplied to us at any time by or on behalf of the KMRCL in connection with this Tender or with the above-mentioned Works and without your written authority or as otherwise required by law, not to publish or otherwise disclose the same.

4. We submit with this Tender a duly executed Tender Guarantee in respect of our obligations under this Tender.

5. We understand that you are not bound to accept the lowest or any tender you may receive.

6. We declare that the submission of this Tender confirms that no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item or work related to the award and performance of this Contract. We further confirm and declare that no agency commission or any payment
which may be construed as an agency commission has been, or will be paid and that the tender price does not include any such amount. We acknowledge the right of the Employer, if he finds to the contrary, to declare our Tender to be non-compliant and if the Contract has been awarded to declare the Contract null and void.

7. This Tender shall be governed by and construed in all respects according to the laws for the time being in force in India. The courts at Kolkata will have exclusive jurisdiction in the matter.

Witness: We are, Gentlemen,

Signature: Yours faithfully,

Date

Name

Address

Witness: Address

For and on behalf of

Signature: Signature

Date

Name

Address

* Note:

If the Tenderer comprises a joint Venture or consortium:

(a) the provisions marked with an asterisk are to be retained subject to deletion of the brackets and inapplicable descriptions (i.e. joint venture or consortium)

(b) the liability of each member under the Tender, and under any contract formed upon its acceptance, will be joint and several;

(c) an authorised representative of each member must sign the Tender.

(d) Signature on the Form of Tender shall be witnessed and dated.

(e) Duly notarised# Power of Attorney issued in favour of Authorized representative of each member of Joint Venture/Consortium shall be attached.

(f) Duly notarised#, irrevocable Power of Attorney issued by each member of Joint Venture/Consortium in favour of Leader of the Joint Venture/Consortium for participation in this tender shall be attached.

(g) Power of Attorney of the authorized representative of each member of Joint Venture/Consortium who issues the Power of Attorney in favour of Leader of the Joint Venture/Consortium, with clear evidence that the person is authorized to issue such Power of Attorney shall be attached.

# Regarding notarization requirements, please refer ITT Clause T5.10
CONDITIONS OF CONTRACT
CONDITION OF CONTRACT

C1.0 DEFINITION AND INTERPRETATION

In the contract, unless the context otherwise requires:

C1.1 "Acceptance of Tender" means the letter or memorandum communicating to the Contractor the acceptance of his tender and includes an advance acceptance of his tender.

C1.2 "Consignee" means where the stores are required by the acceptance of tender to be dispatched by rail, road, air or streamer, the person specified in the Acceptance of tender to whom they are to be delivered at the destination; where the stores are required by the acceptance of tender to be delivered to a person as an interim consignee for the purpose of dispatch to another person, such other persons, and in any other case the person to whom the stores are required by the acceptance of tender to be delivered in the manner therein specified;

C1.3 "Contract" means and includes Tender Invitation, Instructions to Tenderers, Tender, Acceptance of Tender, Conditions of Contract, Particular specifications, particulars and the other conditions specified in the acceptance of tender and includes a repeat order, which has been accepted or acted upon by the contractor and a formal agreement, if excluded;

C1.4 The "Contractor" means the person, firm or company with whom the order of the supply is placed and shall be deemed to include the Contractor's successors (approved by the purchaser), representatives, heirs, executors and administrators, as the case may be unless excluded by the terms of the contract;

C1.5 The "Sub-contractor" means any person, firm or company for whom the contractor may obtain any material or fittings to be used in the supply or manufacture of the stores;

C1.6 "Drawing" means the drawing or drawings specified in or annexed to the specification;

C1.7 The "Inspecting Officer" means the person, or organization specified in the contract for the purpose of inspection of stores of work under the contract and includes his/their authorized representatives;

C1.8 "Material" means anything used in the manufacture or fabrication of the stores;

C1.9 "Particulars" include:-
   a. Specifications;
   b. Drawings
   c. "Proprietary mark" or "brand" means the mark and brand of the product which is owned by an industrial firm;
   d. Any other details governing the construction, manufacture or supply of stores as may be prescribed by the contract;
C1.10 “Proving Test” means such test or tests as are prescribed by the specifications to be made by the Purchaser, or his nominee, after erection at site, before the plant is taken over by the Purchaser;

C1.11 “Purchase Officer” means the officer signing the acceptance of tender and includes any officer who has authority to execute the relevant contract on behalf of the Purchaser;

C1.12 The “Purchaser” means the Kolkata Metro Rail Corporation Ltd.

C1.13 “Signed” includes stamped, except in the case of acceptance of tender or any amendment thereof;

C1.14 “Site” means the place specified in the contract at which any work is required to be executed by the Contractor under the contract or any other place approved by the Purchaser for the purpose;

C1.15 “Stores” means the goods specified in the contract, which the Contractor has agreed to supply under the contract;

C1.16 “Test” means such test as is prescribed by the particulars or considered necessary by the Inspecting Officer whether performed or made by the Inspecting Officer or any agency acting under the direction of the Inspecting Officer.

C1.17 “Work” means all the work specified or set forth and required in and by the said specifications, drawings and “Particular specifications”, hereto annexed or to be implied there from or incidental thereto, or to be hereafter specified or required in such explanatory instructions and drawings (being in conformity with the said original specifications, drawings and “Particular specifications”) and also in such additional instructions and drawings not being in conformity as aforesaid, as shall from time to time, during the progress of the work hereby contracted for, be supplied by the Purchaser;

C1.18 The delivery of the stores shall be deemed to take place on delivery of the stores in accordance with the terms of the contract, after approval by the Inspecting Officer if so provided in contract:
   i. the consignee at his premises; or
   ii. where so provided, the interim consignee at his premises; or
   iii. a carrier other person named in the contract for the purpose of transmission to the consignee; or
   iv. the consignee at the destination station in case of contract stipulating for delivery of stores at destination station.

C1.19 “Writing” or “Written” includes matter either in whole or in part, in manuscript, typewritten, lithographed, cyclostyled, photographed, or printed under or over signature or seal, as the case may be.

C1.20 Word in the singular includes the plural and vice-versa.
C1.21 Words importing the masculine gender shall be taken to include the feminine gender and words importing persons shall include any company or association or body of individuals, whether incorporated or not.

C1.22 The heading of these conditions shall not affect the interpretation or construction thereon.

C1.23 Terms and expression not herein defined shall have the meanings assigned to them in the Indian Sale of Goods Act, 1930 or the Indian contract Act, 1872 or the General Clauses act, 1897 as the case may be.


C1.25 “Facilities” means the Plant and Equipment to be supplied and installed, as well as all the Installation Services to be carried out by the Contractor under the Contract.

C1.26 “Employer” means the person named as such in the Tender Data Sheet and includes the legal successors or permitted assigns of the Employer.

C2.0 CONTRACT DOCUMENTS

C2.1 Subject to Article Order of Precedence of the Contract Agreement, all documents forming part of the Contract (and all parts thereof) are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

C3.0 SEVERABILITY

C3.1 If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable, such prohibition, invalidity or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

C4.0 TIME FOR COMMENCEMENT AND COMPLETION

C4.1 The Contractor shall commence work on the Facilities within the period specified in the Particular specifications and without prejudice to the Contractor shall thereafter proceed with the Facilities in accordance with the time schedule specified.

C4.2 The Contractor shall attain Completion of the Facilities (or of a part where a separate time for Completion of such part is specified in the Contract) within the time stated in the Tender Data Sheet.

C5.0 CONTRACTOR’S RESPONSIBILITIES

C5.1 The Contractor shall design, manufacture, deliver and carry out defect liability period obligation (including associated purchases and/or subcontracting) with due care and diligence in accordance with the Contract.

C5.2 The Contractor confirms that it has entered into this Contract on the basis of a proper examination of the data relating to the Facilities provided by the Employer, The Contractor acknowledges that any failure to acquaint itself with all such data and
information shall not relieve its responsibility for properly estimating the difficulty or cost of successfully performing the Facilities.

C5.3 The Contractor shall comply with all laws in force India. The laws will include all local, state, national or other laws that affect the performance of the Contract and bind upon the Contractor. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties and expenses of whatever nature arising or resulting from the violation of such laws by the Contractor or its personnel, including the Subcontractors and their personnel.

C6.0 CONFIDENTIAL INFORMATION

C6.1 The Employer and the Contractor shall keep confidential and shall not, without the written consent of the other party hereto, divulge to any third party any documents, data or other information furnished directly or indirectly by the other party hereto in connection with the Contract, whether such information has been furnished prior to, during or following termination of the Contract. Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor.

C6.2 The Employer shall not use such documents, data and other information received from the Contractor for any purpose other than the operation and maintenance of the Facilities. Similarly, the Contractor shall not use such documents, data and other information received from the Employer for any purpose other than the design, procurement of Plant and Equipment, construction or such other work and services as are required for the performance of the Contract.

C6.3 The obligation of a party under the Clauses above, however, shall not apply to that information which

(a) now or hereafter enters the public domain through no fault of that party
(b) can be proven to have been possessed by that party at the time of disclosure and which was not previously obtained, directly or indirectly, from the other party hereto

Otherwise lawfully becomes available to that party from a third party that has no obligation of confidentiality.

C7.0 PARTIES

C7.1 The parties to the contract are the Contractor and the Purchaser, as defined in clauses C1.4 and C1.12.

C7.2 A person signing the tender or any other document in respect of the contract on behalf of the Contractor without disclosing his authority to do so shall be deemed to warrant that he has authority to bind the Contractor. If it is discovered at any time that the person so signing has no authority to do so, the Purchaser may, without prejudice to any other right or remedy of the Purchaser, cancel the contract and make or authorize the making of a purchase of the stores at the risk and cost of such person and hold such person liable to the Purchaser for all costs and damages.
arising from the cancellation of the contract including any loss which the Purchaser may sustain on account of such purchase. The provision of clause C13.2 shall apply to every such purchase as far as applicable.

C8.0 CONTRACT

C8.1 This contract is for the supply of the stores of the description, specifications and drawings, and in the quantities set forth in the contract on the date or dates specified therein. Unless otherwise specified, the stores shall be entirely brand new and of the best quality and workmanship to the satisfaction of the Inspecting Officer.

C8.2 The whole contract is to be executed in the most approved, substantial and workmanlike manner, to the entire satisfaction of the Purchaser or his nominee, who, both personally and may his deputies, shall have full power, at every stage of progress, to inspect the stores at such times as he may deem fit and to reject any of the stores, which he may disapprove, and his decision thereon and on any question of the true intent and meaning of the specifications shall be final and conclusive.

C8.3 Any variation or amendment of the contract shall not be binding on the Purchase unless and until the same is duly endorsed on the contract or incorporated in a formal instrument or in exchange of letters and signed by the parties.

C9.0 PERFORMANCE/ADVANCE GUARANTEE BOND

C9.1 Performance Guarantee

C9.2 After an advance acceptance of tender is issued by the Purchaser, the Contractor shall furnish a Performance Guarantee Bond in the proforma attached (Annexure 7) from a Nationalized Indian Bank within 28 days from the receipt of the advance acceptance/placement of Contract. of the tender by the Contractor for an amount equivalent to 10% of the value of the contract. In case of foreign contracts, the Performance Guarantee from a commercial bank of the Contractor's country can be accepted only if the bond is furnished after getting it duly counter-signed by the Reserve Bank of India/state Bank of India, or by any Nationalized Indian Bank. The expenses to be incurred for the counter signature shall be borne by the Contractor.

C9.3 In case furnishing of an acceptable Performance Guarantee Bond is delayed by the Contractor beyond the period provided in the clause C9.5, and the bond is accepted by the Purchaser, liquidated damages, as provided in clause C13.2 for the period delay in submission of the bond, shall be levied. Alternatively, the Purchaser may declare the contract as at an end and enforce the clause C13.2.

C9.4 If the Contractor, having been called upon by the Purchaser to furnish Performance Guarantee Bond fails to furnish the same, it shall be lawful for the Purchaser: -

i) to recover from the Contractor the amount of Performance Guarantee Bond by deducting the amount from the pending bills of the Contractor under any
contract with the Purchaser or the government or any other person contracting through the Purchaser or otherwise however, or

ii) to cancel the contract or any part thereof and to purchase or authorize the purchase of the stores at the risk and cost of the Contractor and in that event the provisions of clause C13.2 shall apply as far as possible.

C9.5 The PBG shall cover period of contract and also the warranty period and should be valid until 90 days beyond the warranty period. On the performance and completion of the contract in all respects the performance-cum-warranty/guarantee bond will be returned within 90 days after completion of warranty/guarantee period.

If the contract is also placed for CAMC, then PBG will be returned after getting the PBG of 5% value of the contract for CAMC as specified in the Particular specifications.

C9.6 The Purchaser shall be entitled and it shall be lawful on his part to forfeit the amount of the Performance Guarantee Bond in whole or in part in the event of any default, failure or neglect on the part of the Contract in the fulfillment or performance in all respects of the contract under reference or any other contract with the Purchaser shall also be entitled to deduct from the amount of the Performance Guarantee Bond any loss or damage which the Purchaser may suffer or be put by reason of or due to any act or other default, recoverable by the Purchaser from the Contractor in respect of the contract under reference or any other contract and in either of the events aforesaid to call upon the Contractor to maintain the amount of the Performance guarantee Bond as its original limit by furnishing fresh Bank Guarantee of additional amount, provided further that the Purchaser shall be entitled to recover any such claim from any sum then due or which at any time thereafter may become due to the Contractor under this or any other contracts with the Purchaser.

C9.7 The Performance Guarantee Bond shall remain in full force and effect during period that would be taken for satisfactory performance and fulfillment in all respects of the contract i.e. till satisfactory commissioning of the machines at consignee's works & later on warranty guarantee period, and shall in the first instance be valid until 90 days beyond the contract period before the expiry of the date of validity of the Performance Guarantee Bond, the Contractor on being called upon by the Purchaser from time to time, shall obtain from the Guarantee Bank, extension of time for validity thereof for a period of six months, on each occasion. The extension or extensions aforesaid, executed on non-judicial stamp paper of appropriate value must reach the Purchaser at least thirty days before the date of expiry of the Performance Guarantee Bond on each occasion.

C9.8 As and when an amendment is issued to the contract, the Contractor shall, within 15 days of the receipt of such an amendment furnish to the Purchaser an amendment to the Performance Guarantee Bond rendering the same valid for the contract as amended and up to twelve months beyond the extended delivery date.

C9.9 The Performance Guarantee Bond and or any amendment thereto shall be executed on a stamped paper of requisite money value in accordance with the laws of the country in which the same is/are executed by the party competent to do so. The Performance Guarantee Bonds executed in India shall also be got endorsed
by the collector under section 32 of the Indian Stamp act, 1899 for adequacy of the
stamp Duty, by the contractor.

The Performance Guarantee Bond shall be furnished as Annexure-7.

**C10.0 TAXES AND DUTIES**

**C10.1** Except as otherwise specifically provided in the Contract, the Contractor shall
bear and pay all taxes, duties, levies and charges assessed on the Contractor, its
Subcontractors or their employees by all municipal, state or national government
authorities in connection with the Facilities in and outside India.

**C10.2** The Contract Price shall be adjusted to take account of any change, increase or
decrease of any taxes and duties including Custom Duties, Excise Duties, Sales
Taxes, Service Tax, Additional Tax etc. enacted by law of the land in India only,
affecting the cost of the goods and introduced after the date of submission of the
Tender.

In case the tenderer has not quoted the rates of taxes and duties separately and
quoted the prices inclusive of taxes and duties and same has been considered for
evaluation in accordance with clause no. T10.7 of ITT, KMRCL will not adjust the
payment for an upward revision in the taxes and duties during the execution of the
contract. However, for any downward revision, the benefit accrued shall be passed on
KMRCL.

If a tenderer quotes concessional rates of duties and taxes and subsequently rate of
applicable taxes and duties revised by the Government then revision of taxes &

duties on concessional rates of taxes & duties quoted by the firm will be adjusted
on pro-rata basis.

**C10.3** In the event of exemption or reduction of Custom Duties, Excise Duties, Sales
Tax or any other Cess/Levy being granted by the Government in respect of the
works, the benefit of the same shall be passed on to the Employer.

**C11.0 DELIVERY**

**C11.1.** The Contractor shall as may be required by the Purchaser either deliver free or
F.O.R, F.O.B or C&F at the place detailed in the contract, the quantities of the
stores detailed therein and the stores shall be delivered or dispatched not later
than the dates specified in the contract. The delivery will not be deemed to be
complete until and unless the stores are inspected and accepted by the
Inspecting Officer as provided in the contract.

**C11.2** Notwithstanding any inspection and approved by the Inspecting Officer on the
Contractor's premises, property in the stores shall not pass on the Purchaser until
the stores have been received, inspected and accepted by the consignee.

**C11.3. In case of foreign contracts:** -

The stores shall be delivered by the Contractor free on board such vessels in such
port or ports named in the quotation, as the Purchaser or his nominee may require.
Such number of inspection certificates, advice notices, packing accounts and invoices, as may be required by the purchaser or his nominee, shall be furnished by the Contractor at his own cost.

C12.0 NOTIFICATION OF DELIVERY

C12.1 Notification of delivery or dispatch in regard to each and every installment shall be made to the Purchaser, consignee and Port consignee (if applicable) immediately on dispatch or delivery. The Contractor shall further supply to the consignee, or the interim consignee, as the case may be, a packing account quoting number and date of the acceptance of tender and date of dispatch of the stores. All packages shall be fully described in the packing account and full details of the contents for the packages and quantity of materials shall be given to enable the consignee to check the stores on arrival at destination. The copy of Railway Receipt/Consignment note or Bill of Lading with other shipping documents, if any shall be forwarded to the consignee and or the port consignee named in the contract, as applicable, by registered post immediately on the dispatch of stores. The contractor shall bear and reimburse to the Purchaser demurrage charges, if any, paid by reason of delay on the part of the Contractor in forwarding the copy of the Railway Receipt, Consignment Note or Bill of Lading and other shipping documents.

C13.0 TIME FOR AND DATE OF DELIVERY; THE ESSENCE OF THE CONTRACT

The time for and the date specified in the contract or as extended for the delivery of the stores shall be deemed to the essence of the contract and delivery must be completed not later than the dates so specified or extended.

C13.1 Progressing of Deliveries

The contractor shall allow reasonable facilities and free access to his works and records to the inspecting officer, progress officer or such other officer as may be nominated by the Purchaser for the purpose of ascertaining the progress of the deliveries under the contract.

C13.2 Failure and Termination

If the contractor fails to deliver the stores or any installment thereof within the period fixed for such delivery in the contract or as extended or at any time repudiates the contract before the expiry of such period, the purchaser may without prejudice to his other rights:

a. Recover from the Contractor as agreed liquidated damages and not by way of penalty a sum equivalent to 1/2% of the price of any stores (including elements of taxes, duties, freight etc.) which the Contractor has failed to deliver within the period fixed for delivery in the contract or as extended for each or part of a week during which the delivery of such stores may be in arrears where delivery thereof is accepted after expiry of the aforesaid period subject to max. of 10%, or

b. Cancel the contract or a portion thereof and if so desired purchased or authorize the purchase of the stores not so delivered or others or similar description (where stores exactly complying with particulars are not, in the opinion of the Purchaser, which shall, be final, readily procurable) at the risk and cost of the Contractor. It shall, however, be in the discretion of the Purchaser to obtain or not the Performance Guarantee Bond from the
firm/firms on whom the contract is placed at the risk and expense of the defaulting firm.

Where action is taken under sub-clause (b) above, the Contractor shall be liable for any loss which the Purchaser may sustain on that account provided the purchase, or, if there is an agreement to purchase, such agreement is made, in case of failure to deliver the stores within the period fixed for such delivery in the contract or as extended within six months from the date of such failure and in case of repudiation of the contract before the expiry of the aforesaid period of delivery, within six months from the date of cancellation of the contract. The Contractor shall not be entitled to any gain on such purchase and the manner and method of such purchase shall be in the entire discretion of the Purchaser. It shall not be necessary for the Purchaser to serve a notice of such purchase on the Contractor.

Note: - in respect of the stores which are not easily available in the market and where procurement difficulties are experienced, the period for making risk purchase shall be nine months instead of six months provided above.

C13.3. Extension of Time for Delivery

If such failure as in the aforesaid clause C13.2 shall have arisen from any cause which the Purchaser may admit as reasonable ground for extension of time, the Purchaser shall allow such additional time as he considers to be justified by the circumstances of the case, and shall forgo the whole or such part, as he may consider reasonable, of his claim for such loss or damage as aforesaid. Any failure or delay on the part of Sub-Contractor, though their employment may have been sanctioned, shall not be admitted as a reasonable ground for any extension of time or for exempting the contractor from liability for such loss or damage as aforesaid.

C13.4  Consequences of Rejection

If on the stores, being rejected by the Inspecting Officer or Interim Consignee or Consignees at the destination, the Contractor fails to make satisfactory supplies within the stipulated period of delivery, the Purchaser shall be at liberty to:--

i) require the Contractor to replace the rejected stores forthwith but in any event not later than a period of 21 days from the date of rejection and the Contractor shall bear all cost of such replacement including freight, if any on such replacing and replaced stores but without being entitled to any extra payment on that or any other account; or

ii) Purchase or authorize the purchase of quantity of the stores rejected or others of a similar description (when stores exactly complying with particulars are not in the opinion of the Purchaser, which shall be final, readily available) without notice to the Contractor at his risk and cost and without affecting the Contractor’s liability as regards the supply of any further installments due under the contract; or

iii) Cancel the contract and purchase or authorize the purchase of the stores or other of a similar description (when stores exactly complying with particulars are not in the opinion of the Purchaser, which shall be final, readily available) at the risk and cost of the contractor. In the event of action being taken under
sub-clause (ii) above or under this sub-clause, the provisions of clause C13.2 above will apply as far as applicable.

iv) Where under the contract the price payable is fixed F.O.B port of export or F.O.R dispatching station, the Contractor shall, if the stores are rejected at destination by the consignee, be liable, in addition to his other liabilities, including refund of price recoverable in respect of the stores so rejected, to reimburse to the Purchaser the freight and all other expenses incurred by the Purchaser in this regard.

C13.5 Removal of rejected stores

i) On rejection of any stores submitted for inspection at a place other than the premises of the Contractor, such stores shall be removed by the Contractor at his own cost subject as herein after stipulated, within 21 days of the date of intimation of such rejection. If the concerned communication is addressed and posted to the Contractor at the address mentioned in the contract, it will be deemed to have been served on him at the time when such communication would in the course of ordinary post reach the Contractor, provided that where the price or part thereof has been paid, the consignee is entitled without prejudice to his other rights to retain the rejected stores till the price paid for such stores is refunded by the Contractor save that such retention shall not in any circumstances be deemed to be acceptance of the stores or waiver of rejection thereof.

ii) All rejected stores shall in any event and circumstances remain and always be at the risk of the Contractor immediately on such rejection. If such stores are not removed by the Contractor within the periods aforementioned, the Inspecting Officer may remove the rejected stores and either return the same to the Contractor at his risk and cost by such mode of transport as the Purchaser or Inspecting Officer may decide, or dispose of such stores at the Contractor's risk and on his account and retain such portion of the proceeds, if any, from such disposal as may be necessary to recover any expense incurred in connection with such disposals (or any price refundable as a consequence of such rejection). The purchaser shall, in addition, be entitled to recover from the Contractor handling and storage charges on the rejected stores after the expiry of the time-limit mentioned above.

iii) The stores that have been dispatched by rail and rejected after arrival at destination may be taken back by the contractor either at the station where they were rejected or at the station from which they were sent, after refunding the price paid for such stores and other charges refundable as a consequence of such rejection. If the contract is placed for delivery F.O.R. station of dispatch, the Contractor shall pay the carriage charges on the rejected consignment at public tariff rates from the station of dispatch to the station where they are rejected. If the Contractor elects to take back the goods at the station from which they were dispatched, the goods shall in addition, be booked back to him freight to-pay at public tariff rates and at Contractor's risk. The Contractor shall be liable to reimburse packing and incidental costs and charges incurred in such return of rejected stores in addition to other charges refundable as a consequence of rejection. The goods shall remain the property of the Contractor unless and until accepted by the Purchaser after inspection.
C14.0  FORCE MAJEURE

In the event of any unforeseen event during the currency of the Contract, such as war, hostilities, acts of public enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes, lockouts, or acts of God, as a result of which, either party (purchaser/contractor) is prevented, or hindered in performing any of its obligations under the contract, then it shall within a week from the commencement thereof, notify the same in writing to the other party with reasonable evidence thereof. If the force majeure condition(s) mentioned above be in force for a period of 90 days or more at any time, the either party shall have the option to terminate the contract on expiry of 90 days of commencement of such force majeure by giving 14 days' notice to the other party in writing. In case of such termination, no damages shall be claimed by either party against the other, save and except those which had occurred under any other clause of this contract prior to such termination.

C15.0  ACCEPTANCE OF STORES DISPATCHED AFTER THE EXPIRY OF DELIVERY PERIOD

C15.1 In case where only a portion of the stores ordered is tendered for inspection at the fag end of the delivery period and also in cases where inspection is not completed in respect of the portion of the stores tendered for inspection during the delivery period because of the reason that adequate notice for inspection in accordance with clause C16.1 was not given by the Contractor, the Purchaser reserves the right to cancel the order of the balance quantity, at the risk and expense of the Contractor without any further reference to him. If the stores tendered for inspection during or at the fag end of the delivery period are not found acceptable after carrying out the inspection, Purchaser is entitled to cancel the contract in respect of the same at the risk and expense of the Contractor. If, however, the stores tendered for inspection are found acceptable, the Purchaser may grant an extension of the delivery period subject to the following conditions: -

a. The purchaser has the right to recover from the Contractor the liquidated damages on the stores, which the Contractor has failed to deliver within the period fixed for delivery.

b. That no increase in price on account of any statutory increase in or fresh imposition of Custom Duty, Excise Duty, Sales Tax, Freight charges or on any account of any other tax or duty leviable in respect of the stores specified in the contract, which takes place after the date of delivery period stipulated in the said Acceptance of Tender, shall be admissible on such of the said stores as are delivered after said date.

c. That notwithstanding any stipulation in the contract for increase in price on any other ground, no such increase which takes place after the delivery date stipulated in the contract shall be admissible on such of the said stores as are delivered after the said date.

d. But nevertheless the Purchaser shall be entitled to the benefit of any increase in price on account of reduction in or remission of Customs Duty, Excise Duty, sales tax or on account of any other ground which takes place after the expiry of the delivery date stipulated in the contract. The contractor shall allow the said benefit in his bills or
In the absence thereof shall certify that no decrease in price on account of any of these factors has taken place.

C15.2 The Contractor shall not dispatch the stores till such time an extension in terms of clause C15.1 (a) to (d) above is granted by the Purchaser and accepted by the Contractor. If the stores are dispatched by the Contractor before an extension letter aforesaid is issued by the Purchaser and the same are accepted by the consignee, the acceptance of the stores shall be deemed to be subject to the conditions (a) to (d) mentioned in clause C15.1 above.

C15.3 In case where the entire quantity has not been tendered for inspection within the delivery period stipulated in the contract and the Purchaser chooses to grant an extension of the delivery period the same would be subject to conditions (a) to (d) mentioned in the clause C15.1 above.

C16.0 INSPECTION BY INSPECTING OFFICER

C16.1 When Inspection during manufacture or before delivery or dispatch is required, notice in writing shall be sent by the contractor to the Inspecting Officer when the stores or material to be supplied are ready for inspection and test, and no stores shall be delivered or dispatched until the Inspecting Officer has certified in writing that such stores have been inspected and approved by him. At least 4 weeks' notice must be given to the Inspecting Officer to enable him to arrange the necessary inspection. The examination of stores will be made as soon as practicable after the same have been submitted for inspection, and the result of the examination will be notified to the Contractor.

C16.2 In cases where the Inspecting authority specified in the contract requires on behalf of the Purchaser that inspection of the raw materials to be used and/or stage inspection during the manufacturing process of the components stores etc. is also be done, notice in writing shall be sent by the contractor to the Inspecting Officer to visit his premises/works to test the raw materials and/or conduct necessary inspecting during the manufacturing process of the component/store etc. as deemed essential.

C16.3 No alterations, amendments, omissions, additions, suspensions, or variations of the work (hereinafter referred to as "Variations") under the contract as shown by the drawing or the specifications shall be made by the contractor except as directed in writing by the Inspector, but the Inspector shall have full power, subject to the proviso hereinafter contained, from time to time, during the execution of the contract, by notice in writing to instruct the contractor to make such variation without prejudice to the contract, and the contractor shall carry out such variations and be bound by the same conditions, so far as applicable, as though the said variation occurred in the specifications. If any suggested variation would, in the opinion of the contractor, if carried out, prevent him from fulfilling any of his obligations or guarantees under the contract, he shall carried out. If the Inspector confirms his instructions, the contractor's obligations and guarantees shall be modified to such an extent as may, in the opinion of the Inspector, be justified. The difference of cost, if any occasioned by any such variations shall be added to or deducted from the contract price as the case may require. The amount of such difference, if any, shall be ascertained as determined in accordance with the rates specified in the schedules of prices, so far as the same may be applicable, and where the rates are not contained in the said schedules or not applicable they shall be settled by the Purchaser and contractor jointly. But the Purchaser shall not become liable for the payment of any change in
respect of any such variations, unless the instructions for the performance of the same shall have been given in writing by the Inspector.

C16.4 In the event of Inspector requiring any variations, such reasonable and proper notice shall be given to the contractor, as will enable him to make his arrangements accordingly, and in cases where goods or materials are already prepared, or any designs, drawings or patterns made or work done is required to be altered, a reasonable sum in respect thereof shall be allowed by the Purchaser, provided that no such variations shall, except with the consent in writing of the contractor, be such as will involve an increase in the total price payable under the contract by more than 10 percent thereof.

C16.5 In any case, in which the contractor has received instructions from the Inspector for carrying out the work which either then or later, will, in the opinion of contractor, involve a claim for additional payment, the contractor shall, as soon as reasonably possible, after receipt of the instructions foresaid, advise the Inspector to that effect.

C16.6 Marking of Inspection

The Contractor shall, if so required, at his own expense, mark all the approved stores with a recognized Purchaser's mark. The stores which cannot be so marked shall, if so required by the Inspecting Officer, be packed at the Contractor's expense in suitable packages or cases, each of which shall be sealed and marked with such mark.

C17.0 PACKING AND MARKING

C17.1 Packing

The Contractor shall pack at his own cost the store sufficiently and properly for transit by rail/road, air and/or sea as provided in the contract so as to ensure their being free from loss or damage on arrival at their destination. He shall decide the packing for the stores by taking into account the fact that the stores will have to undergo arduous transportation before reaching the destination and will have to be stored and handled in tropical climatic conditions (Including Monsoons) before being put to actual use.

Unless otherwise provided in the contract, all containers (including packing cases, boxes, tins, drums and wrappings) in which the stores are supplied by the Contractor shall be considered as non-returnable and their cost as having been included in the contract price.

Each packages shall contain a packing note specifying the name and address of the Contractor, the number and date of the acceptance of tender and the Designation of the Purchase Officer issuing the supply orders, the description of the stores and the quantity contained therein.

C17.2 Marking

The marking of all goods supplied shall comply with the requirement of the Indian Acts relating to merchandise marks or any amendment thereof and the rules made there under. The following marking of the material is required: -
The following particulars should be stenciled with indelible paint on all the materials/packages:-

a. Contract No.
b. Specification no.
c. Item No.
d. Post Consignee (wherever applicable)
e. Abbreviated Consignee marks.

In addition to the marking as specified above, distinguish colour marks should be given so as to distinguish the ultimate Consignees in India.

C18.0 PAYMENT TERMS

The standard payment terms subject to recoveries, if any, by way of Liquidated Damages shall be as mentioned in Special Conditions of Contract.

C19.0 PAYMENT PROCEDURE

C19.1 Payment against foreign contractors will be through irrevocable letter of credit. All charges levied by the foreign banks shall be borne by the Contractor.

C19.2 Payment for indigenous supply shall be made by KMRCL in INR against the documents as mentioned in clause C18.0.

C20.0 RESPONSIBILITY OF THE CONTRACTOR FOR EXECUTING THE CONTRACT

C20.1 Risk in the stores

The Contractor shall perform the contract in all respects in accordance with the terms and condition thereof. The stores and every constituent part thereof, whether in the possession or control of the Contractor, his agents or servants or a carrier, or in the joint possession of the Contractor, his agents or servants and the Purchaser, his agents or servants, shall remain in every respect at the risk of the Contractor, until their actual delivery to the consignee at the stipulated place or destination or, where so provided in the acceptance of tender, until their delivery to a person specified in the contract as interim consignee for the purpose of dispatch to the consignee. The Contractor shall be responsible for all loss, destruction, damage or deterioration of or to the stores from any cause whatsoever while the stores after approval by the Inspecting Officer are awaiting dispatch or delivery or are in the course of transit from the Contractor to the Consignee or the interim consignee as the case may be. The Contractor shall alone be entitled and responsible to make claims against any carrier in respect of non-delivery, short delivery, misdelivery, loss, destruction, damage or deterioration of goods entrusted to such carrier by the Contractor for transmission to the consignee.

C20.2 Consignee's Right of Rejection

Notwithstanding any approval which the Inspecting Officer may have been given in respect of the stores or any materials or other particulars or the work or workmanship involved in the performance of the contract (whether with or without any test carried out by the Contractor or the Inspecting Officer or under the direction of the Inspecting Officer) and notwithstanding delivery of the stores
where so provided to the interim consignee, it shall be lawful for the consignee, on behalf of the Purchaser, to reject the stores or any part, portion of consignment thereof within 45 days after actual delivery thereof to him at the place or destination specified in the contract if such stores or part, portion of consignment thereof is not in all respects in conformity with the terms and conditions of the contract whether on account of any loss, deterioration or damage before dispatch or delivery or during transit or otherwise howsoever.

Provided that where, under the terms of the contract, the stores are required to be delivered to an interim consignee for the purpose of dispatch to the consignee, the stores shall be at the Purchaser's risk after their delivery to the interim consignee, but nevertheless it shall be lawful for the consignee on behalf of the Purchaser to reject the stores or any part, portion of consignment thereof upon their actual delivery to him at the destination if they are not in all respect in conformity with the terms and conditions of contract except where they have been damaged or have deteriorated in course of transit or otherwise after their delivery to the interim consignee.

The provisions contained in clause relating to the removal of stores rejected by the Inspecting Officer shall, mutatis mutandis apply to stores rejected by the consignee as herein provided.

The contractor shall refund any advance /part payment received him in respect of the rejected stores within 21 days of the receipt of intimation from the consignee about the rejection of the stores. In default, the Purchaser may take steps against contractor for recovery of such price. This is strictly without prejudice and in addition to the rights provided in clause C13.4.

C20.3 Subletting and Assignment

The contractor shall not sublet (otherwise than that which may be customary in the trade concerned), transfer, assign or otherwise part with directly or indirectly to any person or persons, whatever is in this contract, or any part thereof without the previous written permission of the Purchaser or his nominee.

In the event of the contractor's failure to obtain such permission, the Purchaser shall be entitled to cancel the contract and to purchase the stores elsewhere on the Contractor's account and risk and the contractor shall be liable for any loss or damage which the Purchaser may sustain in consequence or arising out of such purchase.

C21.0 RESPONSIBILITY FOR COMPLETENESS

C21.1 Any fittings or accessories which may not be specifically mentioned in the specifications but which are useful or necessary are to be provided by the Contractor without extra charge, and the plant must be complete in detail.

C21.2 The work shall be performed at the place or places specified in the contract or at such other place or places as may be approved by the Purchaser.

C21.3 In all cases where the contract provides for tests on site, the Purchaser, except where otherwise specified, shall provide, free of charge, such labour, materials, fuels, stores, apparatus and instruments as may be required from time to time and as may reasonably be demanded, efficiently to carry out such tests of the plants, materials or workmanship etc. in accordance with the contract.
C22.0  INDEMNITY

C22.1 The prices stated are to include all rights (if any) of patent, registered design or trade mark and the Contractor shall at all times indemnify the Purchaser against all claims which may be made in respect of the stores for infringement of any right protected by patent, registration of designs or trade mark; provided always that in the event of any claim in respect of alleged breach of a patent, registered designs or trade mark being made against purchaser, the Purchaser shall notify the Contractor of the same and the Contractor shall, at his own expense, either settle any such dispute or conduct any litigation that may arise there from.

C22.2 All such property shall be deemed to be in good condition when received by the Contractor unless he shall have within 24 hours of the receipt thereof notified the Purchase Officer or the concerned authority to the contrary. If the Contractor fails to notify any defect in the condition or quality of such property, have shall be deemed to have lost the right to do so at any subsequent stage.

C22.3 The Contractor shall return all such property and shall be responsible for the full value thereof to be accessed by the Purchaser/loaning authority whose decision shall be final and binding on the Contractor. The Contractor shall be liable for loss or damage to such property from whatever cause happening while such property is in the possession of or under the control of the Contractor, his servants, workmen or agents.

C22.4 Where such property is insured by the Contractor against loss or fire at the request of the Government or Purchaser such insurance shall be deemed to be effected by way of additional precaution and shall not prejudice the liability of the Contractor as aforesaid.

C23.0  CORRUPT PRACTICES

C23.1 The Contractor shall not offer or give or agree to give to any person in the employment of the Purchaser or working under the orders of the Purchaser any gift or consideration of any kind as an inducement or reward of doing or forbearing to do or having done or forborne to do any act in relation to the obtaining or execution of the contract or any other contract with the Purchaser or Government or for showing any favour or for bearing to show disfavour to any person in relation to the contract or to any other contract with the Purchaser or Government. Any breach of the aforesaid condition by the Contractor, or any one employed by him or acting on his behalf, under Chapter IX of the Indian Penal code, 1860 or the Prevention of Corruption Act, 1947 or any other act enacted for the prevention of corruption by public servants shall entitle the Purchaser to cancel the contract and all or any other contracts with the Contractor and to recover from the Contractor the amount of any loss arising from such cancellation in accordance with the provision of clause C13.2.

C24.0  INSOLVENCY AND BREACH OF CONTRACT

C24.1 The Purchaser may at any time, be notice in writing summarily determine the contract without compensation to the Contractor in any of the following events, that is to say: -

i. if the Contractor being an individual or in a firm. Any partner thereof, shall at any time, be adjudged insolvent or shall have a receiving order or order
for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or enter into any assignment or composition with his creditors or suspend payment or if the firm be dissolved under the Partnership Act, or

ii. If the Contractor being a company is wound up voluntarily or by the order of a Court or a Receiver, Liquidator, or Manager on behalf of the debenture holders is appointed, or circumstances shall have arisen which entitle the Court or Debenture holders to appoint a Receiver, Liquidator or Manager, or

iii. If the contractor commits any breach of the contract not herein specifically provided for.

iv. Provided always that such determination shall not prejudice any right of action or remedy which shall have accrued or shall accrue thereafter to the Purchaser and provided also the Contractor shall be liable to pay to the Purchaser any extra expenditure he is thereby put to and the Contractor shall, under no circumstances, be entitled to any gain on repurchase.

C25.0 LAWS GOVERNING THE CONTRACT

C25.1 This contract shall be governed by the Laws of India for the time being in force.

C25.2 Irrespective of the place of delivery and the place of payment under the contract, the contract shall be deemed to have been made at the panel in India from where the acceptance of tender has been issued.

C25.3 Jurisdiction of Courts :- The Courts of the place from where the acceptance of tender has been issued shall above have jurisdiction to decide any dispute arising out of or in respect of the contract.

C26.0 ARBITRATION

C26.1 If conciliation fails, then such disputes or differences, whatsoever arising between the parties, arising out of touching or relating to manufacture, measuring operation or effect of the Contract or the breach thereof shall be referred to Arbitration in accordance with the following provisions:

i. Matters to be arbitrated upon shall be referred to a sole Arbitrator where the total value of claims does not exceed Rs. 1.5 million. Beyond the claim limit of Rs. 1.5 million, there shall be three Arbitrators. For this purpose Employer will make out a panel of engineers. This panel will be of serving or retired engineers of Government Departments or of Public Sector Undertakings;

ii. For the disputes to be decided by a sole Arbitrator, a list of three engineers taken from the aforesaid panel will be sent to the Contractor by the Employer from which the Contractor will choose one;

iii. For the disputes to be decided by three Arbitrators, the employer will make out a list of five engineers from the aforesaid panel. The Contractor and Employer shall choose one Arbitrator each and the two so chosen shall choose the third Arbitrator from the said list who shall act as the presiding Arbitrator;
iv. Neither party shall be limited in the proceedings before such Arbitrators(s) to
the evidence or the arguments put before the Conciliator;

v. The Conciliation and Arbitration hearings shall be held in Kolkata only. The
language of the proceedings that of the documents and communications shall
be English and the awards shall be made in writing. The Arbitrators shall
always give item-wise and reasoned awards in all cases where the total claim
exceeds Rs. One million; and

vi. The award of the sole Arbitrator or the award by majority of three Arbitrators as
the case may shall be binding on all parties.

C26.2 Interest on Arbitration Award

Where the arbitral award is for the payment of money, no interest shall be payable on
whole or any part of the money for any period, till the date on which the award is made.

C26.3 Cost of Arbitration

The cost of arbitration shall be borne by the respective parties. The cost shall, inter
alia, include the fees of the Arbitrator(s) as per rates fixed by the Employer from time to
time.

C26.4 Jurisdiction of Courts

Where recourse to a Court is to be made in respect of any matter, the Employer and
the Contractor agree to the sole jurisdiction of courts in Kolkata.

C26.5 Suspension of work on Account of Arbitration

The reference to Conciliation/ Arbitration shall proceed not withstanding that the Works
shall not then be or be alleged to be complete, provided always that the obligations of the
Employer, Engineer and the Contractor shall not be altered by reasons of arbitration
being conducted during the progress of the Works. Neither party shall be entitled to
suspend the work or part of the work to which the dispute relates on account of
arbitration and payments to the Contractor shall continue to be made in terms of the
Contract.

C27.0 SECRACY

C27.1 The Contractor shall take all reasonable steps necessary to ensure that all persons
employed in any work in connection with the contract, have full knowledge of the
Official Secrets Act and any regulations framed thereunder.

C27.2 Any Information obtained in the course of the execution of the contract by the
Contractor, his servants or agents or any person so employed, as to any matter
whatsoever, which would or might be directly or indirectly, of use to enemy of India,
must be treated secret and shall not any time be communicated to any person.

C27.3 Any breach of the aforesaid conditions shall entitle the Purchaser to cancel the
Contract and to purchase or authorize the purchase of the stores at the risk and cost of
the Contract in accordance with the clause C13.2 of the Conditions of Contract. In the
event of such cancellation, the stores or parts manufactured in the execution of the
contract shall be taken by the Purchaser at such price as he considers fair and
reasonable and the decision of the Purchaser as to such price shall be final and binding on the Contractor.

C28.0  WARRANTY

C28.1  The contractor shall warrant the everything to be furnished hereunder shall be free from defects and faults in design, material, workmanship and manufacture and shall be of the highest grade and consistent with the established and generally accepted standards for goods of the type ordered and in full conformity, with the contract specifications and samples if any and shall if operable, operate properly.

C28.2  This warranty shall survive inspection of, payment for and acceptance of the goods and shall expire after the period as specified in special condition of contract. Any approval of acceptance by purchaser of the stores or of the material incorporated here in shall not in any way limit the contractor's liability.

C28.3  The contractor's liability in respect of any complaints defects and or claims shall be limited to the furnishing and installation of replacement parts free of any charge or the repair or defective parts only to the extent that such replacement or repairs are attributable to or arise from faulty workmanship or material or design in the manufacture of the stores.

C28.4  The contractor shall, if required, replace or repair the goods or such portion thereof as is rejected by the Purchaser free of cost at the ultimate destination or at the option of the purchaser, the contractor shall pay to the purchaser value thereof at the contract price or in the absence of such price decided by the Purchaser, and such other expenditure and damages as may arise by reason of the breach of the condition herein specified.

C28.5  All replacement and repairs that the Purchaser shall call upon the Contractor to deliver or perform under this warranty shall be delivered and performed by the Contractor, promptly and satisfactory in accordance with the requirements. In case where replacement of parts take place during the warranty period, the provision of this warranty clause shall apply to replaced/repaired part until and expiration of extended warranty period as indicated in Special Conditions of Contract from the date of such replacement and/or repair. This extended period shall be hereinafter be referred to as "Extended Warranty Period".

C28.6  If the contractor so desires, the replaced parts can be taken over by him or his representative in India for disposal as he deems fit at the time of replacement of goods/parts. No claim whatsoever shall lie on the Purchaser for the replaced parts thereafter.

C28.7  The decision of the Purchaser in regard to Contractor's liability and the amount, if any, payable under this warranty shall be final and conclusive.

C28.8  All other terms and conditions of warranty will be as specified in Special Conditions of Contract and Particular specifications.
SPECIAL CONDITIONS OF CONTRACT
SPECIAL CONDITION OF CONTRACT

1. Payment Terms: (refer clause no. C18.0 of COC)

1.1 Foreign Suppliers:- All the payments will be made through an unconfirmed, irrevocable Letter of Credit (LC) payable at site from a bank in India.

i) 90% payment of the supply value of stores will be made, on submission of following documents:

(a) Certificate from the purchaser's of having receipt of PBG as per COC, clause no. C9.0 of tender document.
(b) Invoice in duplicate.
(c) Shipping documents/Proof of Dispatch (Bill of Lading/Air Way Bill).
(d) Inspection Certificate
(e) Factory Acceptance Test Report
(f) Copy of Insurance document (Insurance to be arranged by the Purchaser in case of FOB/C&F contract).
(g) Packing list.
(h) Certificate of country of origin.

ii) Balance 10% payment value along with installation, testing, commissioning charges & O&M documentation and training to Employer's staff charges will be made through irrevocable Letter of Credit (LC) on furnishing of following documents:

(a) Purchaser's Certificate indicating the successful receipt, installation, testing, commissioning, operational acceptance, training to Employer's staff and receipt of O&M Manuals etc. as per Schedule of Requirement.

iii) Payment for maintenance of equipment during DLP will be released on quarterly basis on submission of certificate from consignee for satisfactorily maintenance of equipment/plant.

Payment should be followed strictly as per terms and conditions of Tender Documents.

1.2 For indigenous Suppliers:-

i) 90% payment of the supply value of stores will be made, on submission of following documents:

(a) Certificate from the purchaser's of having receipt of Performance Guarantee Bond as per COC, clause no. C9.0 of tender document.
(b) Invoice in duplicate.
(c) Inspection Certificate
(d) Factory Acceptance Test Report.
(e) Certificate from Consignee of having receipt & acceptance of material in good condition.
ii) Balance 10% payment value along with installation, testing, commissioning charges & O&M documentation and training to Employer's staff charges will be made on furnishing of following documents

   (a) Purchaser's Certificate indicating the successful receipt, installation, testing, commissioning, operational acceptance, training to Employer's staff and receipt of O&M Manuals etc. as per Schedule of Requirement.

iii) Payment for maintenance of equipment during DLP will be released on quarterly basis on submission of certificate from consignee for satisfactorily maintenance of equipment/plant.

2. Warranty (refer clause no. C28.0 of COC)

Warranty period of the equipment along with all its sub systems shall be 24 months from the date of commissioning of the equipment. All other terms and conditions of the warranty shall be as mentioned in Schedule of Requirement/Particular Specification and in clause no. C28.0 of conditions of contract.
PARTICULAR SPECIFICATION

1. AUTOMATIC TRAIN WASH PLANT
## BILL OF QUANTITIES

A. Bill of Quantity for the Package (Quantity required for Central Park Depot of Kolkata Metro, Kolkata).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item Description</th>
<th>Quantity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Design, Manufacturing, Supply, Installation, Testing &amp; Commissioning and Training of AUTOMATIC TRAIN WASH PLANT with specification as per Particular specifications.</td>
<td>01 set</td>
</tr>
</tbody>
</table>
# CONTENTS

## 1. PROJECT AND PERMANENT WORKS ................................................................. 3

1.1 LOCATION AND BOUNDARIES .................................................................. 3
1.2 GENERAL DESCRIPTION OF THE WORKS ............................................... 3
1.3 DETAILED SCOPE OF WORKS .................................................................. 3
1.4 DESIGN RESPONSIBILITY ......................................................................... 4
1.5 PRELIMINARY WORKS ............................................................................ 6

## 2.0 GENERAL DESIGN REQUIREMENTS ........................................................... 7

## 3.0 SPECIFIC REQUIREMENTS ......................................................................... 9

3.1 OPERATING PRINCIPLE............................................................................ 9
3.2 PLANT CAPACITY .................................................................................. 10
3.3 PLANT ASSEMBLIES ............................................................................ 10
3.4 PLANT LAYOUT .................................................................................... 11
3.5 REFERENCE DATA OF COACHES ......................................................... 11
3.6 WASHING PROCESS STATION ............................................................... 11
3.6.1 Pre-wet Station .............................................................................. 12
3.6.2 Detergent Station .......................................................................... 12
3.6.3 Water Brush Station ....................................................................... 12
3.6.4 Final Rinse Station ......................................................................... 13
3.7 DETERGENT DOSING MODULE ............................................................ 13
3.8 WATER STREAK REMOVAL MODULE ................................................. 13
3.9 WATER RECYCLE MODULE ............................................................... 13
3.9.5 WATER RECYCLE MODULE USING FILTRATION/ ADSORPTION/ AERATION .................................................................................. 14
3.10 CONTROL CONSOLE ........................................................................... 15
3.10.1 DCC Control Console .................................................................. 15
3.10.2 Local Control Console .................................................................. 16
3.11 SIGNAGE ................................................................................................ 16
3.12 CONNECTION TO WATER TANK ......................................................... 16
3.13 WASH PIT ........................................................................................... 17
3.14 CONNECTION TO EFFLUENT TREATMENT PLANT ............................. 17
3.15 Technical Alternatives ........................................................................... 17

## 4.0 STANDARD REQUIREMENTS ..................................................................... 18

4.1 SPRAY NOZZLES ................................................................................... 18
4.2 BRUSHES ................................................................................................ 18
4.3 PUMP WORK ........................................................................................ 19
4.4 PIPING AND STEELWORK .................................................................. 19
4.5 ELECTRICAL/ELECTRONICS EQUIPMENT ......................................... 19
4.6 SAFETY PROVISION ........................................................................... 20
4.7 MAINTENANCE PROVISION ............................................................... 20
4.8 MATERIAL PROTECTION ...................................................................... 21

## 5.0 CHECKS AND TESTS .............................................................................. 22

5.1 IN-MANUFACTURER’S-PLANT .............................................................. 22
5.2 AT-SITE ................................................................................................ 22

## 6.0 DOCUMENT SUBMISSION ........................................................................ 23

6.1 FOR EXECUTION OF BUILDER’S WORK ............................................... 23
6.2 FOR EXECUTION OF WORK .................................................................... 23
6.3 AT COMPLETION OF WORK ................................................................. 23
7  TRAINING ............................................................................................................. 24
8  MAINTENANCE ..................................................................................................... 24
9  SPARES .................................................................................................................. 25
10 SCHEDULE OF KEY DATES .................................................................................. 27
11 SCHEDULE OF ACCESS DATES .......................................................................... 28
12 INTERFACE AND COORDINATION .................................................................... 29
13.1 INTERFACE WITH DESIGNATED DEPOT CIVIL CONTRACTOR (S) .............. 29
13.2 INTERFACE WITH DESIGNATED E&M WORK CONTRACTOR ....................... 29
13.3 INTERFACE WITH DESIGNATED TRACK WORK CONTRACTOR .................. 30
13.4 INTERFACE WITH ROLLING STOCK CONTRACTOR ...................................... 30
13.5 INTERFACE WITH DESIGNATED SIGNALING CONTRACTOR ......................... 30
1.0 PROJECT AND PERMANENT WORKS

1.1 Location and Boundaries

The location plans together with the indicative works and Site area boundaries are shown on the Drawings in the Tender Document. The Designated Depot Civil Contractor shall set out the Works and Site area boundaries of the Contract.

1.2 General Description of the Works

1.2.1 The Works shall comprise the design, manufacture, delivery, installation, testing, and commissioning of Fully Automatic Train Washing Plants and a Reverse Osmosis plant of suitable capacity to meet the entire plant water requirement at the receiving end to the

1.2.2 KMRCL shall execute only usual civil work as per design submitted by the contractor and provide power supply and water but compressed air supply or any things other than power supply & water if required shall be arranged by the contractor on permanent basis. Any special material required for grouting /foundation or inter connection shall be supplied by contractor along with the instruction to use.

The Train Washing Plants shall be complete with washing process stations, water recycle module, control consoles and all accessories required to make the equipment fully functional and with a set of special tools and test equipment. The equipment/ sub- assemblies which shall be used in the plant to be supplied under the contract should have already been used by the contractor in at least five such plants supplied worldwide and should have worked satisfactorily.

1.2.3 All the major brought out items which are required to be used in the machine shall be of proven make and shall be procured only after taking employers’ approval for the same, with a complete submission of each item mentioning, make, country of origin, parts numbers, catalogues etc.

1.2.4 The contractor shall quote for supply of the specified fully automatic train wash plant capable of washing sidewalls, roof, front & rear walls of the train.

1.3 Detailed Scope of Works

The scope of the Works, in addition to those specified in the General Specification, includes the followings:

1.3.1 Design, manufacture, supply, testing & commissioning and training of Fully Automatic Train Washing Plant a Reverse Osmosis plant of suitable capacity to meet the entire plant water requirement at the receiving end to the plant. Tenderer shall carryout water testing in the respective locations.

1.3.2 Preparation and supply of drawings, documents, samples, specimens and operation & maintenance manuals as specified.

1.3.3 Supply of resources, materials, tools, plant and manpower for fabrication, delivery, installation and testing of the equipment to meet the intended function and arrange

1.3.4 Training of employer’s engineers

1.3.5 Where necessary, confirm license applications and statutory submissions in accordance with Enactments up to the commencement of the Defects Liability Period.

1.3.6 Maintenance of machine during DLP

The manufacture should either directly or through associate company have trained manpower and maintenance facilities in India preferably in Kolkata. The associate company must have at least 3 years experience of manufacturing the machine for railways/metros application or of giving
after-sales service for machine used in railways/metros. The bidder shall commit to maintain at least 2 trained and skilled engineers for the package. The competency of the trained manpower deputed for the purpose of maintenance during DLP period shall be certified by the contractor. The contractor shall submit complete credentials of associate company in compliance with this clause within 2 months of placement of order. Bidder shall submit undertaking as per format is placed at Appendix-B.

1.3.7 Provide spares & parts catalogue-containing details of all equipments & suppliers as mentioned in clause -9 of PS.

1.4 Design Responsibility

The Contractor shall be responsible for the design of the Permanent Works, which shall include but not be limited to:

1.4.1 The development of the design shall be carried out in conjunction with the information contained in the Drawings and shall be in accordance with the Specification set out in the Contract. The contractor shall obtain design approval from the designated Engineer In charge before starting the manufacturing of the Automatic Train Wash Plant.

1.4.2 The Contractor being responsible for the development and completion of the design of any other items of the Works as stated in the Contract, including, without limitation, the updating and amendment of the Drawings from time to time.

1.4.3 The Contractor, coordinating with the Engineer and Designated Contractors on all matters relating to design and documentation, shall retain full responsibility for managing such design and for the maintenance of all documentation associated with the design process. The personnel identified to fulfill these roles shall be direct employees of the Contractor.

1.4.4 The Contractor shall determine and verify as appropriate the materials, site measurements and installation criteria before adopting in the design of the equipment.

1.4.5 The Contractor shall ensure that the information contained in the submissions has been co-ordinated with the overall requirements of the Works and the works of the Designated Contractors.

1.4.6 The information that extracted from the Drawings and adopted by the Contractor in his design shall become the Contractor's design for which neither neither the Employer nor the Engineer shall be responsible.

1.4.7 The Contractor's designs, whether for Temporary Works or Permanent Works which are subject to the approval of any Relevant Authority, shall before submission to the Relevant Authority, be first submitted to the Engineer for review without objection. The Contractor must make all due allowances for the requirements of the Relevant Authorities' approval and consent process in the Works Programme and in the timing of the Works.

1.4.8 Responsibility for the Contractor’s design proposals submitted to the Relevant Authorities shall remain with the Contractor who must provide sufficient resources to deal with subsequent questions, alterations etc. requested by the Relevant Authorities. All communications with any Relevant Authority, whether written or oral, must be copied/recorded to the Engineer.

1.4.9 The contractor may engage local agency for supply of steel, its fabrication and installation related works at site. However selection of such agency will require employer’s prior approval. The contractor shall solely be responsible for design, quality of fabrication works, its installation and shall issue quality certificate for the same. The contractor shall seek design approval of steel & fabrication, other item proposed to be used, from the Engineer in charge.

1.4.9.1 All fasteners shall be of stainless steel. All structures shall be of hot dip GI steel as per BS-729 with minimum coating of 85µm. All water pipelines, Tanks except detergent tank shall be of ABS as per BS5391 part 1, class E or better, fittings as per BS5392 part-1. The contractor shall take prior approval of employer for the selection of pipe, size of pipes and make of pipe and
tanks etc. No drilling of holes in the Structural steel will be permissible after galvanizing. The selection of stainless steel & structural steel shall be made by the contractor duly considering the quality of water available at site in Kolkata Metro and ensure no corrosion on any structure during the life of the plant of 30 years. **All GI steel used by the contractor shall be established to have adequate corrosion resistance against the water & detergent by means of suitable powder coating and it shall be painted with washable paint in such a way that no dirt or dust accumulate on the structure.** The contractor shall test water to his satisfaction & shall submit the report during the detailed design stage. **The entire stainless steel item which shall be provided by the contractor in the plant shall be of SS-316L** and the thickness of water tanks shall not be less than 3mm.

1.4.9.2 Contractor shall demonstrate that the steel structure & metal component used in the plant will last for 30 years without any corrosion.

1.4.9.3 Contractor shall solely be responsible for installation, commissioning & testing of the plant and shall depute his engineers during installation, commissioning & testing.

1.4.10 Stress analysis of sensitive structures shall be carried out from a reputed test house & report shall be submitted.

### 1.5 TENDERER’S TECHNICAL PROPOSAL:

The tenderer shall submit his technical proposal along with deviations, conditions and technical alternatives, if any, as per Schedule-I & Schedule-II & Annexure-5 enclosed in the end shall be part of technical part.

The cost for the unconditional withdrawal of the deviations/conditions/technical alternatives shall be given as per, Schedule-III & Schedule-IV, enclosed in the end, which shall be part of financial bid.

All deviations from the tender documents, remarks, comments etc. shall be included in the Statement of Deviations (Schedule-II). The price of unqualified and unconditional withdrawal of all the conditions, qualifications, deviations etc. as mentioned in (Schedule-II) shall be quoted by the tenderer in the format given in Schedule-III. All implicit and explicit deviations, remarks and comments mentioned elsewhere in the tenderer’s proposal shall be treated as NULL and VOID and considered withdrawn unconditionally. Any clause included in the Statement of Deviations (Schedule-II) but not priced in the Schedule-III, shall be treated as NULL and VOID and will be considered unconditionally withdrawn.

The Tenderer shall provide a valid and fully compliant proposal for the cars as detailed in the Employer’s Requirements. The Tenderer shall submit a detailed clause by clause commentary on all the clauses of the Employer’s Requirements.

Tenderers shall note that their comments to the clause by clause commentary wherever given shall only be in the following form:

- **Complied**: “Complied” shall be indicated by the tenderer where the tenderer is able to comply fully with the clause.

- **Noted**: Where a clause merely provides information, and no other comment is necessary, “Noted” will suffice.

- **Not Complied**: Where the tenderer is not able to comply fully with the clause or has any observation or proposes an alternative design, “Not Complied” shall be indicated and comments if any of the tenderer shall be indicated in detail. All Clauses with status as “Not Complied” shall be included in the statement of Deviations Schedule-II and shall be priced in Schedule-III.

Tenderer shall also note that:

- Any comment by the tenderer in the Clause By Clause Commentary, other than either of “Complied”, “Noted” or “Not Complied” shall be treated as “Not Complied”. Unless
tenderer prices against such clauses in the Schedule-III, the comment against any clause
shall be deemed to have been unconditionally withdrawn with no financial implications
and shall be considered as NULL and VOID.

- Any “Not Complied” comment by the tenderer in the Clause By Clause Commentary
which has not been included in the Statement of Deviations Schedule-II shall be treated
as “Complied”.

- Any “Not Complied” comment by the tenderer in the Clause By Clause Commentary
which has also been included in the Statement of Deviations Schedule-II but has not
been priced in Schedule-III shall be treated as null and void and deemed to have been
unconditionally withdrawn.

- In case price for unqualified withdrawal of any remark, comment, condition, qualification
or deviation etc. indicated in Schedule-II is not quoted in Schedule-III, it shall be
considered that the remark, comment, condition, qualification or deviation is
unconditionally withdrawn without any financial implication. However, Employer at its sole
discretion and option may assess the financial implication of the said remark, comment,
condition, qualification or deviation etc. based on best engineering principles and
concepts, which shall be binding on the tenderer, and the same may be considered by
Employer for financial evaluation.

A tender without a Clause by Clause Commentary, as stated above, is liable to be rejected.

1.6 Preliminary Works
The Contractor shall inspect the Designated Contractors’ enabling works and satisfy himself that
all works required to be carried out by the Designated Contractors are in accordance with the
interface requirements as specified in the interface specification.
2.0 GENERAL DESIGN REQUIREMENTS

The following general requirements on equipment design shall apply to all equipment.

2.1 The Plant shall be of proven design and designed life shall be 30-years without rusting & corrosion in foundation, base frame and structural components. The design life for mechanism, driving components, spray poles, brushes (except bristles) and others parts of the Plant shall be at least 15 years. No major structural repairs and major component replacement shall normally be required during the respective design life. The material & parts used for the same shall be specified in detailed design stage.

2.2 The Plant shall be designed for heavy-duty workshop use and shall be available throughout the year without any limitation in day to day washing process.

2.3 Equipment that requires an electricity supply shall be compatible with the power system of 360-440V, three phase 4 wire, frequency 47.5 to 51.5 HZ & surge protection, low voltage protection to be included whenever necessary.

2.4 Equipment shall incorporate a means of adjustment in order to allow for foundation differential settlement of maximum 25mm.

2.5 Work related to the production of the equipment shall comply with relevant European standards, Codes of Practice and the latest statutory requirements of India including, but not be limited to, the following:

BSEN287 - Approval testing of welders for fusion welding.
BSEN288 - Specification and approval of welding procedures for metallic materials.
BS4575 - Fluid power transmission and control systems.
BS5304 - Code of practice for safety of machinery.
BS5395 - Stairs, ladders and walkways.
BS5950 - Structural use of steelwork in building
BSEN60073 - Specification for coding of indicating devices and actuators by colours and supplementary means.
EN60204 – Electrical equipment
BSEN60529 - Specification for degrees of protection provided by enclosures (IP code).

2.5.1 The layouts given on the Drawings shall be used for conceptual purposes. The Contractor shall furnish their requirements in accordance to the Schedule of Key Dates in the Particular Specification.

2.7 The equipment shall be designed and/or selected to allow operation without over stressing, damaging or interfering in any way whatsoever with other equipment in the Depot.

2.8 Components of equipment of similar construction or similar application shall be mutually interchangeable. The Contractor shall, to the extent that he is responsible for the design or component selections of equipment items recognize and implement all safety requirements and ensure that the design and performance of the equipment are compatible with the suitable International safety standards.

2.9 Equipment shall be “fail-safe” and “overload protected”. The equipment shall incorporate all necessary safety devices to protect the equipment, operators, and all other people in the vicinity of the equipment. No failure of the equipment shall cause or give rise to any damage or catastrophe of any nature whatsoever.
2.10 Equipment design shall take into consideration fire protection, elimination of dust and dirt by means of suitable traps or the like, minimum maintenance requirements and ease of access for cleaning, routine maintenance and general disassembly.

2.11 Guards shall be fitted to all exposed moving parts of the equipment where the environment and working processes of the system dictate that there is a foreseeable risk of injury or causing ill health to personnel from sources such as moving parts, electricity, coolant, noise and vibration, dust and fumes, etc.

Moving parts of the equipment shall be efficiently lubricated to ensure quiet operation as well as durable and reliable service life. Lubrication points shall be clearly identified for easy replenishment with minimum removal of other equipment components. Oil and lubricants used should preferably be available in India or equivalent Indian makes should be advised.

2.12 It shall be the responsibility of the contractor to recommend equivalent indigenous detergent/cleaning agent after establishing their chemical equivalence & without compromising the quality of washes and effect on the car body.

2.13 The environment within which the equipment is to operate shall be taken into consideration in the equipment design. The contractor is advised to carefully examine the air pollutants and deposits generally encountered in Kolkata ambience. The contractor shall collect the sample of water from the work site before taken into consideration in the equipment design.

2.14 Based on the experience gained during test, trials and use of machine or any problem arises during operation of the machine which warrants re-check of the design/manufacture/ quality of the equipment, the contractor shall be responsible for all modification as required and these shall be done without any extra cost to the employer.

2.15 Any modification required to be done for satisfactory cleaning/rinsing/ water streak removal shall be mutually decided & carried out by the contractor free of cost to the satisfaction of Kolkata Metro engineer. Therefore contractor shall carefully consider local ambient condition like pollution, dust & quality of water in their design stage.
3.0 SPECIFIC REQUIREMENTS

3.1 Operating Principle

3.1.1 The Train Washing Plants shall be designed to carry out automatic washing of the body sides, roof, front & rear cleaning of the Kolkata Metro EMU Coaches for standard gauge Corridor. Rolling stock of these corridors is under procurement; the relevant key parameters will be advised during detail design stage. A drawing of Kinematic Envelope (KE) for standard gauge is placed at subsequent annexure for Rolling Stock for vital dimensions.

3.1.2 No fixed structure of the plant shall be installed within the specific structure gauge, for Standard Gauge train of KMRCL, copy of SOD of SG is attached as Annexure-A. Rolling Stocks details will be provided during the detailed design stage.

3.1.3 The Plant shall be of drive-through type and operated in a single direction from one side to other. The plant shall be designed to the satisfactorily clean the train running through the Plant under its own power at a speed of 3 km/h. The power to the train will be supplied via 3rd Rail 750V DC line covering the full length of the washing siding.

3.1.4 The train-washing plant shall be designed for both automatic and manual mode. In automatic mode, the wash cycle shall be activated and stopped by the train movement through limit switches which will act as entry /exit controls. Ultrasonic devices, photo electric cells or other proven approved means to enable the full length of train to complete the entire wash cycle. The limit switch/proximity switch/sensors etc which are required to be provided by the contractor in the tracks for sensing of the movement of trains shall have enough passage for the movement of rolling stocks with 300mm tyre width.

3.1.4.1 The entire plant shall be stopped automatically if the train approaches more than the specified speed as mentioned in clause no 3.1.3. The plant shall automatically shut down after a pre-set time of 30-60 sec in the event of a train stopping inside the plant.

3.1.5 The following facilities/ operation by the control console are required at the Depot Control Center.

(i.) Auto enabling of train wash plant so that the plant is being activated by the presence of train for ensuring complete wash.

(ii.) Selective disabling of plant so that the train can pass through the plant in either direction at a maximum speed of 25 km/h without the washing process taking place.

(iii.) Monitoring of details i.e. status/health, operating hours of the plant shall be monitored at control panel along with audio, VDU. & Printer facility to be supplied by the contractor.

(iv.) Complete graphical Indication of completion of washing cycle shall be available at control console.

(v.) No staffs shall be required to man the plant, other than to clean and replenish stocks of cleaning media.

3.1.6 Manual operation of the Plant shall be allowed at the local control console, which shall be located at the wash area, for maintenance work. Provision shall be made to switch over to „manual” mode of operation, in which the various sequences shall be regulated by individual controls. The design shall provide for by-passing any one or more stages of washing if warranted.

3.1.7 Machine brushes shall able to follow the contour of the body sidewalls ,roof and front & rear glass of the train.

3.1.8 Remote downloading of the diagnostic and status/ health of machine, through Wi-Fi access shall be provided within the depot premises, necessary arrangement for this purpose shall be provided.
so that commercially available laptop is used for the same. Any special hardware, software if any required for this purpose shall be provided by the contractor. During operation of the machine if it becomes inevitable to isolate a particular sub system, the same should be possible thorough simple operation. Details of such requirements shall be finalized during design. **The cost of Wi-Fi system may be quoted as optional.**

3.1.9 The plant and its accessories shall have necessary provisions for interlocking of entry and exit controls with the spray nozzles manifold so that the plant may not operate in the event of failure of the entry and exit controls.

3.1.10 The brushes shall automatically retract to their gauges in the event of any malfunction or activation of emergency stop buttons.

3.1.11 The pumps shall automatically shut down in the event of lack of water or detergent solution.

### 3.2 Plant Capacity

3.2.1 The Plant shall wash the lateral sides of the coaches from the cant level to the deck level, roof, full front & back. The trains to be washed will consist of, 6 cars with train lengths of approximate 130m.

3.2.2 The Plant shall be used to wash a minimum of 5 trains of 130 m length each per hour and shall be available for 24 hours in a day.

3.2.3 The Plant shall be capable of allowing trains to pass through the plant in either direction at a maximum speed of 25 km/h without the washing process taking place.

### 3.3 Plant Assemblies

3.3.1 **Assemblies by Train Washing Plant Contractor**

The Plant shall comprise the following equipment, which shall be provided by the Contractor.

- Control Console at Depot Control Centre
- Local Control Console
- Pre-wet Station
- Detergent Brush Station
- Water Brush Station
- Final Rinse Station
- Water Recycle Module
- Detergent Dosing Module
- Water Streak Removal Module
- Accessories such as sensing device/ switches, control gears and signage

3.3.2 **Provisions by Other Contractors**

The Plant shall also include the following provisions, which will be provided by other Designated Contractors to the Washing Plant Contractor for integration into the Plant.

- Under ground Water Tank
- Used water collecting tanks
- Track work
- Third rail line
- Drain points and pipes for effluents discharged to the Effluent Treatment Plant of the Depot.
3.4 Plant Layout

The assemblies of the Plant, except some signage, shall be laid out in the following locations as indicated on the Drawings.

- A wash area 800m² (approx.), shall be provided at the side of stabling area of the Depot.
- Underground water storage tanks.
- Control console with cabling in suitable cable ducts at the Depot Control Centre, which is approx 1000m from the wash area.

The wash area shall accommodate the, all washing stations, water streak removal module, hot air blower to remove water streak. Local control console water recycle module, detergent dosing module, water tank, used water collecting tanks, and associated pumps, valves, meters etc inside a plant room.

If store for any other items is required, it shall be accommodated in the plant room.

The Depot Control Centre at the main depot building shall accommodate the control console for master control of the Plant at a remote location.

All the cables and pipes linking the two areas shall run parallel to the track in a trench and cross the track in corrosion resistant sleeve pipes, perpendicularly under the tracks. Such a crossing shall be at either ends of the wash bay area.

In addition, the layout of the plant shall be arranged to enable acid washing to be added at a later stage when it is found necessary. Space shall be reserved for the installation of an additional set of pre-wet station, a set of acid station and associated assemblies. The reserved space for acid station shall be at a minimum distance of 30m ahead the water brush station.

3.5 Reference Data of Coaches

The configuration of the Plant shall be designed to fit the characteristics of the EMU coaches. The car body is made of stainless steel for standard gauge. Final specification of the car body material shall be advised during design stage. The indicative dimensions of Rolling Stocks being purchased are given for reference in the Chapter 3 of SOD and the exact dimensions shall be obtained from the RS Contractor.

3.6 Washing Process Station

a The tender shall submit detail process flow of the complete system along with the reasons attributed to each step and additional measures taken in design for improving design to suit specified ambient conditions.

b The washing process of the Plant shall be optimized, for maximum cleanliness of the coaches, with the parameters of the detergent composition, brushing momentum, spraying pressure and flow rate of each single process and water consumption.

c The indicative flow rates of the washing stations are given below. Further optimization (considering the dusty weather condition as prevail in the city of Kolkata) will be preferred with advance design features with out compromising on the cleaning quality.

- Pre-wetting 300 litre/min
- Detergent solution 240 litre/min
- Water brushing – first stage 240 litre/min
- Water brushing – second stage 240 litre/min
- First rinsing 300 litre/min
- Final rinsing (from R.O) 100 litre/min
The contractor shall carry out all necessary work complete with tanks (except civil work as specified clause no 1.2), pumps, pipes, valves, filters, meters and accessories as required in each station.

The contractor has to provide a water consumption meter of reputed make at inlet line.

3.6.1 Pre-wet Station

A pair of spray poles, one on each side, shall be provided for pre-wetting of the car body surfaces. The pre-wetting shall be performed by spray nozzles to break down surface tension for even adherence of further washing medium.

The pre-wetting process shall adopt recycled water, which shall be supplied from the water recycle module. The pre-wet station shall be activated automatically only after the ambient temperature reaches above 10 degree C.

3.6.2 Detergent Station

3.6.2.1 This station shall consist of one pair of vertical brushes with stainless steel spray poles, suited to cleaning the lateral faces of the trains, one pair of split horizontal brushes with gantry, each to cover the full front and back respectively (as optional). Suitable brushes shall also be provided with stainless steel spray holes for roof cleaning. These brushes shall have motor driving from the top and one side motors driving (actuator) the brush into the side of the train. The electrical current to the one side motors are controlled such a way that the brush shall have a consistent lap with side of the train. The brushes shall also follow the shape of the train if it changes. Each brush shall include an arrangement to spray water mixed detergent solution evenly on the car surface. Drawings shall be supplied with the offer for better understanding of the design along with the offer. Any alternative of proven design may be submitted with detail justification elaborating advantages and past experience. The provision shall be made to vary the chemical application from HMI panel from 0.1 to 2.3 %

3.6.2.2 The contractor shall interface with Rolling Stock contractor for selecting detergent suitable for cleaning Rolling Stocks bodies taking to account the environmental condition of Kolkata. The contractor shall preferably use Indian detergent; otherwise contractor shall propose equivalent Indian detergent within 6 months of plant commissioning. In case of imported detergent, technical & purchase specification shall be provided.

3.6.2.3 The detergent solution shall not exceed a pH value of 9; so as to eliminate risks of detrimental chemical reactions but it will be decided after interface with Rolling Stock contractor. The detergent shall preferably be either chemically neutral with capability of emulsifying the adhering dirt, or slightly acidic with capability of loosening the adhering metal particles for easy removal.

3.6.3 Water Brush Station

Two pairs of vertical brushes, two on each side, shall be provided for water brushing on the car body surfaces and suitable arrangement for front & back and roof cleaning. Each brush shall be integrated with a spray pole with simultaneous operation. The water brushing process shall be divided into two stages. The first stage shall adopt recycled water while the second stage shall use fresh water / recycled water supplied from the water tank. These brushes shall have motors driving the brushes from the top. The brush rotor shall be controlled by pneumatically or electrically to ensure that the bush follows the contour of the train profile.

The brush section lengths are profiled to suit the train outline. The two stages of water brush station shall be separated with appropriate distance such that the water sprayed at each stage can be individually collected by separate drain.
3.6.4 Final Rinse Station

3.6.4.1 Final rinsing shall be in two stages, first stage rinsing & second stage rinsing with R.O water. For first stage rinsing minimum one set of spray pole and for second stage rinsing, minimum two sets of spray poles to be provided but detailed may be worked out during the design stage as per train cleaning requirement to the satisfaction of employer.

3.6.4.2 The final rinsing process shall be designed with the consideration of water streak removal. A portion or all of the water for final rinsing shall be supplied from the water streak removal module.

3.7 Detergent Dosing Module

3.7.1 The detergent-dosing module shall be equipped with tools to facilitate dosing of the detergent agent in the designed proportion controlled through PLC. Pump shall be of metering adjustable pumps. Any adjustment of detergent quantity metering shall be available through HMI.

3.7.2 The module shall be complete with all necessary tanks of 10000 Litres capacity, pumps, pipes, valves, meters and accessories. Stainless steel tanks with sufficient thick gauge walls shall be used for detergent storage.

3.8 Water Streak Removal Module

3.8.1 The water streak removal technique to be adopted shall effectively eliminate the possibility of water streaks after final rinsing. This can be achieved by introducing the 2 sets flap type fixed spongy pad which has consistent lap with the side of the train after final rising station, to eliminate the possibility of water streaks after final rinsing. Provision shall be made to dry out the pad after each wash. Any alternative design of providing series blowers in both sides of the train to eliminate the possibility of water streaks after final rinsing or tenderer may propose any other alternative proven design which suits up to the satisfaction of employer requirement may be explained in the offer with customer satisfactory reports. The adoption of the technique shall be taken into account the quality and ingredients of the water supply in Kolkata.

3.8.2 Filtration of water shall be done with Reverse Osmosis system for the final wash of train coaches in the Auto train wash plant. The system shall be from reputed suppliers only. The plant shall be design after checking the water quality of the site only. Treated water from R.O shall be collected in a separate suitable tank of 10000 Litres or more capacity. The amount of water output from R.O plant for washing of trains shall be sufficient enough to meet the plant capacity as mentioned in clause no-3.2 above. Tender shall describe the entire process, supported by calculation. Before final rinsing process, Hardness of water shall be less than 5 ppm.

3.8.3 The module shall be complete with all necessary tanks, pumps, pipes, valves, meters and accessories.

3.9 Water Recycle Module

3.9.1 The water recycle module shall be provided to minimize the water consumption of the train washing plant.

(a) Fresh water from the main shall be used for R.O. Plant reservoir.

(b) Used water from the first & final rinse station & second stage water brush station shall be collected after proper screening by underground reinforced concrete recycling tanks. The recycling of the water shall be fully treated as per the process specified in this specification at clause no 3.9.5. The final recycled water shall then be reused in the pre-wet station, first stage water brush station and fully treated water (soft water) from softener plant shall be used as make up water for detergent wash, for first rinse station and second water brush station and input to R.O plant. The input to softener plant shall be taken from the recycled water storage tank with a provision for make up by fresh water.

(c) All water from the stations of pre-wetting, detergent spraying and first-stage water brushing shall be collected in a sump to discharge to the effluent treatment plant.
3.9.2 The module shall filter the used water to a standard that eliminates the possibility of spray nozzle clogging at the respective stations.

3.9.3 The module shall be complete with all necessary tanks, pumps, pipes, valves, meters and accessories.

3.9.4 Sufficient care shall be taken to prevent rusting at the plant design itself.

3.9.5 **Water recycle Module using Filtration/ Adsorption / Aeration**

The water recycle module shall be provided to minimize the water consumption of the Train Washing Plants and ensure that recycled water does not contain sediments, free oil viz. grease etc., residue detergent and odour.

i. **Particulars**

The unit shall be designed to treat wastewater coming from train washing. The aim is to recycle part of treated water and discharge the excess. The use of soft water should be limited to first rinsing and water brush section & detergent wash only.

Treatment shall include the following:

- Filtration through Quartzite or similar
- Adsorption through activated carbon
- Oxidization by air injection

The cleaning action is aimed at the destruction of:

- Suspended substances,
- Surface-active agents,
- Anaerobic bacteria, responsible for the formation of unpleasant odours

The excess water can be discharged in to the drainage system connected to the effluent treatment plant (ETP).

ii. **Procedure Description**

This will be in three stages.

**Stage I**

**a. Removal of sludge**

The water used during the train wash phases shall be collected in the underground tank where heavy solids, sand and slurry settle by gravity. The sludge removal from the tanks shall be easy and fully accessible. The procedure of sludge removal shall be simple and should be mechanized. Tender shall include details of the sludge removal system.

**Stage II**

**b. Removal of suspended particles, oils, hydrocarbon and residue detergents & filtration of used water from stage I.**

The water shall then be further processed for removal of free oils and hydrocarbons. After pretreatment of sedimentation and degreasing, the water shall be processed for removal of suspended particles, oils and residue detergents. For this the water shall be taken to the filtering column by using a pump and then to the activated carbon filter and then collected to the underground tank, shall then be collected in a tank to remove/withheld surface-active agents & organic pollutants. The filters shall have facility of automatic back washing (preferably minimum once a day but frequency will decided as per the field trial) using fresh water.

**Stage III**
c. Removal of unpleasant odors from stage II

An oxidizing line shall be used by the accumulation tanks to ensure that no unpleasant odours arise, particularly during the hottest period of the year caused by the inevitable decomposition of the organic substances (e.g. surface active agents) contained in the wastewater.

Stage IV

d. Water softening plant.

The water softening plant shall be used to reduce the hardness of the water of partially treated water coming from the recycle tank and fresh water from mains. The level of hardness of the water from softener plant shall be less than 300.

3.10 Control Console

3.10.1 The control console at the Depot Control Centre (DCC) shall be provided for normal automatic operation of the Plant and the local control console at the wash area for manual operation during maintenance work of the Plant.

3.10.2 The control of the Plant shall be fitted with PLC to safeguard and sequence all automatic processes and movements. The changes required in sequencing or timing of various operations shall be implementable through control panel HMI touch screen Control of related and conflicting operation functions shall be interlocked to enable logical operation of wash cycle. The screen shall be selectable from menu and shall also provide diagnostic /faults messages. The control shall have the provision to revert back to a pre determined setting of the plant should there be any wrong setting by an operator.

The contractor shall furnish complete details of flow chart sequencing ladder diagram etc developed for plant operation. Necessary hardware & software programme shall be provided to incorporate changes in installed application software.

3.10.3 The consoles shall be provided with HMI touch screen display /pushbuttons switches for various operations as well as indicating lamps / meters for monitoring the operations in progress.

3.10.4 The consoles shall allow spare spaces for apparatus installation, such as intercom & telephone, in the future.

3.10.5 DCC Control Console

The DCC Control Console shall be provided with the following minimum control functions and monitoring functions.

- Main isolator key switch on / off
- Console selection DCC console / local console
- Washing plant mode wash / no wash
- Detergent spray station on / off
- Emergency stop button turn to release
- Washing in process flashing amber light
- Train passing by complete graphic display showing the positioning of train while washing.
- Common major fault signal flashing red light & E-stop
- Common minor fault signal flashing yellow light for repair
- Lamp test button pushbutton.
3.10.6 Local Control Console

A single control panel monitors (HMI) and operates the wash plant. The operation is fully automatic but panel shall also allow manual override so that plant can be controlled from plant room. The local Control Console shall be provided with the following minimum control functions and monitoring functions.

- Console power on / off
- Plant power key switch on / off
- Plant operation auto / manual
- Washing plant mode wash / no wash
- Detergent level low
- Individual washing process on / off
- Emergency stop button turn to release
- Status of individual process flashing amber light
- Fault signal for each sub-assemblies flashing red light
- Pressure gauge for each pump line meter
- Lamp test button pushbutton
- Supply failure (water, pneumatic system, electricity) flashing red light

3.11 Signage

Signage shall be provided along the track of the washing plant to notice the train drivers of the operation status of the plant. The letters of the signage legends shall be of adequate size to be read at a distance of 20m.

A single illuminated digital signage with legends shall be erected at the entrance end of the washing plant. The legends shall indicate following messages depending on operational status of the plant:

- "WASHER DISABLED: DEPOT SPEED" if the Plant is switched off,
- "DO NOT ENTER" if the Plant is engaged for a trains coming from exit end direction, or
- "TRAIN WASH: SPEED 3km/h MAX." at all other times.

Similarly a single illuminated signage with legends shall be erected at the exit end of the washing plant. The legends shall indicate the following messages depending on operational status of the plant:

- "DO NOT ENTER" if the Plant is engaged for entry end trains, or
- "DEPOT SPEED" at all other times.

Panel duly painted with fluorescent paint shall be erected at 130 m, from the Plant with the legends of “END OF WASHING FOR 6-CAR” for Kolkata Metro plants at depot. All the signage marked on metallic sheet shall be on stainless steel.

3.12 Connection to Water Tank

The water tank will be constructed by a Designated Contractor and will be in a form of underground concrete pit with a capacity of approximately 30 m³. The tank will be filled up in 24 hours at a pressure of about 3 bars from the water mains.

Sump pumps and pipes shall be provided by the Washing Plant Contractor to pump the fresh water from a water tank, which is located close to wash area, for train washing process.
3.13 Wash Pit

The wash pit shall be designed by washing plant contractor with appropriate partitions, grating and drain valves for drainage of wastewater, the drainage of storm water and collection of recycle water. The wash pit shall be designed with reinforced concrete structure for the support of the railway track running through the facility.

The wash pit will be constructed by a Designated Contractor of KMRCL.

3.14 Connection to Effluent Treatment Plant

The effluents to be discharged from the Train Washing Plants will be drained to the Effluent Treatment Plant (ETP) of the Depot. The ETP, which is not part of this Contract, will be located 300m (appox) from the washing plant. The piping for such drainage will be provided by the other contractors.

All water from the stations of pre-wetting, detergent spraying and first-stage water brushing shall be discharged to the ETP.

3.15 Technical alternatives

The tenderer may propose technical alternatives in the offer with cost, operation and maintenance advantages provided that the technical alternatives do not degrade the performance requirements as stipulated in the Employers requirements. The technical alternatives shall be submitted which shall include but not limited to:

- Full description of the technical alternative; and
- Changes to the Employers requirements and drawings

The effect on the tender total shall be included in respective statement, placed at Technical Submittal Schedule -IV
4.0 STANDARD REQUIREMENTS

4.1 Spray nozzles

4.1.1 The spray nozzles shall be arranged to wet the surfaces to be washed with optimum efficiency, number and flow rate. The numbers of spray nozzle shall preferably be not less than 10 any per set of brushes for rear & front as well as for side washing.

4.1.2 The spray nozzles shall be made of stainless steel and enclosed within structural steelwork to minimise the possibility of damage. All spray nozzles shall be of adjustable type. The spray nozzles shall emit wide-angle conical spray pattern, perpendicular to the area of sidewalls of the coaches being washed. The spray nozzles shall be set close enough to permit the overlapped spray cones for complete coverage of the surfaces to be washed. However these nozzles shall be installed in such a manner that these remain clear of the structure gauge. These nozzles shall be from reputed manufacturers only and shall give optimum performance without clogging & frequent requirement of cleaning. The source of supply shall be provided in spare parts catalogue.

4.2 Brushes

4.2.1 The brushes shall be mounted on crank arms, which shall protrude the brushes from home positions during brushing as well as retract them after brushing, the device mechanism shall be describe in the offer. The protrusion shall prevent, by adjustable limit switches, any sturdy parts from encroaching the vehicle gauge under all conditions. The brushes shall reach the rotational speed prior to making contacts with the first car. In the event of brush mechanism failure, the brushes shall be retracted from the operative positions. The characteristics of brushes (diameter, rotating speed, type of drive motor etc.) shall be indicated by the tenderer in the offer.

4.2.2 The contractor shall interface with the Rolling Stock contractor for exact profile of cars to suitably design the brushes for side, roof, front & rear of cars.

4.2.3 The bristles of the brushes shall be the composition of LDPE + LLDPE +1% anti UV, with individual section of .8mmX section. The working life of brushes shall be in the order of 1000 hours. The tenderer shall describe the material. The materials shall be soft enough so that it does not make mark on the train body.

4.2.4 The rotating brush diameter shall be determined after interfacing details from the Rolling stock manufacturer.

4.2.5 The brush bristles shall be capable of ensuring proper friction against the sides of the cars while remaining flexible and strong enough so as not to be torn out or cause damage to the rolling stock during passage of various exterior fittings which may slightly protrude beyond the lateral gauge of the cars. The specified life of the brushes shall take into account the quality of water at work site and dust deposit in Kolkata Metro ambient conditions.

4.2.6 The fixing of brushes to the member shall be strong enough to withstand shearing forces generated during its operation, the arrangement of fixing shall be explained in the offer.

4.2.7 In order to limit water splashes and to reduce the transmitted noise of the Plant, the plant shall be enclosed with screens erected alongside the washing area with structural members providing enough reinforcement against strong wind blowing and reduce water spillage and wastage. Separate enclosures shall be made for local controls and electrical panels. The life of the screen shall be same as that of other structural members of the plant. The tenderer shall mention the material composition and its life in the offer.

4.2.8 Minimum 6 brushes shall be provided for cleaning of side walls and pair split brushes for roof, front & rear cleaning split brushes.

4.2.9 The speed of brush cylinder may be of the order of 200-250 RPM.
4.2.10 The minimum numbers of spray nozzle per set of brush shall be 10 nos for roof, rear & front brushes and 8 nos for side brushes.

4.3 Pump Work

All the pumping system for the processes of detergent spraying and final rinsing shall be provided with 100% redundancy. Single failure of any one pump shall not deteriorate the performance of the process.

i. The pumps shall be complete with alternate start-up control between on duty and on standby mode. In the event of one pump failure, another pump shall be set as duty pump. Indian equivalent of pump shall be advised. The pumps shall be metering adjustable pumps.

ii. Pump capacity of each section normally shall not be less than the indicative requirement :-

- Prewetting pump: 4.5 KW
- Detergent dosing pump: 1.5 KW
- Water brushing – first stage pump: 5.5 KW
- Water brushing – second stage pump: 5.5 KW
- First rinsing pump: 7.5 KW
- Final rinsing pump: 2 KW

4.4 Piping and Steelwork

4.4.1 All pipes for delivering the solutions from the detergent dosing module and the water streak removal module shall be of stainless steel tubes of SS316L of required schedule. All other pipes shall be as per clause no -1.4.9.1. Stainless steel pipes and enclosures & fasteners shall only be used to minimize corrosion of mechanical fixtures. The piping and control elements shall be arranged for ease of removal and replacement operations of one or more elements such as solenoid valves, pumps & etc. Piping shall be securely fixed so as to prevent transmission of vibrations to the entire installation.

4.4.2 Water pipes shall be properly positioned to avoid low points all along the length of the pipes. Drain points shall be provided at all low points of the pipes for periodic drainage. Plant shall be designed to avoid any scale formation after prolonged idling.

4.5 Electrical / Electronic Equipment

4.5.1 All control and regulation electronic and electrical devices, etc. shall be mounted in dust-proof switchboards of IP-65 protected and the switched board frame shall covered with stainless steel enclosure. All electrical wiring shall be marked carefully in compliance with the electrical diagrams, and be properly protected against ingress of water.

4.5.2 The temperature inside the closed cubicles installed in open area may rise to more than 50 deg C during summers. Tender shall submit proposal containing the compatibility of the electronics /PLC etc. to withstand the temperature.

4.5.3 The control circuit shall be supplied with low voltage protection.

4.5.4 Protective and safety devices shall be provided such as fuses, circuit breakers, microprocessor based relays, single-phase protection.

4.5.5 The main isolating switch shall be able to be padlocked. The control panel door shall be mechanically interlocked with isolating switch.

4.5.6 All electrical apparatus and metal surfaces of the plant shall be connected to the earthing circuit consisting of a 25mm² bare copper cable inside the suitable GI pipe which shall be provided for
connection to the traction earth return system via a earth isolating switch. The earthing circuit shall be looped.

4.5.7 Pushbuttons and indicating lights on the consoles shall be grouped by functions and identified clearly with legends.

4.5.8 All controls elements shall be wired in generously sized terminal blocks and panels well ventilated, carefully marked and easily accessible. All electrical equipments shall be suitably earthed as per relevant standard.

4.5.9 All glands to the panel shall be of double compression type.

4.5.10 All panels shall be designed to accommodate ambient temperature and humidity conditions, by having heating cum air conditioning systems of reputed international makes only

4.6 Safety Provision

4.6.1 Emergency stop push buttons shall be provided to halt the operation of the brushes, with suitable warning signs in English, at a suitable height to allow easy access. The buttons shall be located at each side of the track in corrosion proof stainless steel enclosures (IP 65), at each end of the wash, at rinse facilities and in the plant room.

4.6.2 Over-speed sensing device (settable) shall be provided to protect the coaches and the Plant against damage by retracting the brushes in the event that the trains are over-speed with the washing being taken place. These shall be only from reputed/ proven suppliers having very good track record.

4.6.3 In the event of lack of water, the pumps of the corresponding stations shall be shut down and the corresponding brushes shall be retracted.

4.6.4 In the event of when a train stops within the plant during an automatic operation, the washing plant operation shall stop automatically after a pre-set time delay.

4.6.5 In the event of a failure of the activation system (one in one million operation), the retraction devices fitted on all brush stations shall automatically return the brush swing arms into their cowls clear of the car body sides.

4.6.6 Stainless steels guards shall be provided at all stations to guard against chemical solution or chemical polluted water from splashing off.

4.6.7 All parts of the Plant including the pipe supports shall have a minimum clearance of 0.5m from the live parts of 3rd rail system and Metro EMU current carrying components.

4.6.8 An alarm indication shall be provided in case of water flooding in underground sump to control wastage water by spilling.

4.6.9 All electrical wirings shall be terminated to junction boxes through proper size glands & no taping shall be permitted. The IP rating of the enclosure shall remain unchanged after provision of glands.

4.7 Maintenance Provision

4.7.1 The brushes shall be made in sections, each capable of being changed individually when life expired. The rotating member of the brush shall be fully secured with respect to safety of the trains and arrangement shall be explained in the offer.

4.7.2 Spray jets, brushes, brush drive gear and other equipment shall be accessible by fixed lockable safety ladders and walkways that shall be provided to ensure routine inspection and maintenance. The interval of such maintenance should be seven days or more. No electrical overhead equipment or wiring should be accessible from these ladders and walkways.

4.7.3 Sufficient number of weatherproof Floodlights of reputed suppliers as approved by employer shall be provided to enable full visibility to the train driver and maintenance work to be carried out at dark.
4.7.4 All equipment that requires maintenance shall be arranged to permit that the equipment is readily accessible for maintenance. The plant equipment & piping layout shall not cause hindrance to the free movement of the maintainer/operator.

4.8 **Material Protection**

4.8.1 The Plant shall be protected against deterioration of the structure and base due to chemical contacts, site and operation conditions.

4.8.2 Piping or any metallic part of the Plant subject to chemical corrosion, shall be corrosion proof for the entire service life of the washing plant.

4.8.3 Suitable well-ventilated enclosure shall be provided to safeguard the outdoor equipment from the ambient conditions.

4.8.4 Protection of all the steel structural elements shall be made by hot-dip galvanization.

4.8.5 All fixed elements of the Plant, all screws, nuts, bolts; clamps, etc. shall be of stainless steel.

4.8.6 The colours for the plant & equipments shall only be anti rusting epoxy painted where galvanization not possible. The finishing coats shall be defined later.
5.0 CHECKS AND TESTS

5.1 In-manufacturer’s-plant

During manufacture, and especially prior to shipment, verifications and checks shall be carried out in order to ensure that the supply is in accordance with the technical specification and with the approved design documents. The Contractor shall provide for all checks of supplies on his sub-contractors’ premises, prior to delivery of these supplies to his workshops.

All quality checks shall be carried out, as required, during manufacture on the Contractor’s or on the sub-contractors’ premises.

Operation of safety and protection devices shall also be checked.

These checks and tests shall also comprise:
- check of proper operation of the machines,
- check of insulation (in case of electrical machine),
- check of assembly work (welds, hardware etc.),
- check of travel speeds,
- check of various safety devices.

The entire supply shall be inspected by the Employer’s representative at the Contractor's premises before shipment to the site.

5.2 At-Site

The contractor shall check the workmanship and quality of entire installation including that of his sub-venders upon completion of erection and commissioning work at site and before offering the same to employer for inspection.

The installation shall be subjected to a series of practical tests, during which the Contractor according to the profile of the cars will adjust the spray nozzles.

The Contractor shall supply sufficient quantity of the cleaning products required for the tests.

The Contractor shall supply detergent/cleaning agent for minimum 1000 train wash the plant after finalizing the type of detergent found most suitable for the trains (detergent/cleaning agent). The detergent shall be finalized after interfacing with rolling stock manufacturer regarding the type of detergent/cleaning agent which will be used.

Integration tests shall be carried out for the trial runs of the Plant with the Metro EMU coaches in order to verify the satisfactory operation of the Plant.

The supplier shall demonstrate the plant performance after successful commissioning at the consignee’s works. Thereafter the consignee shall watch the machine performance for a period up to 2 months or 100 numbers of trains wash, whichever is later before the final proving test certificate is issued.

5.3 DELIVERY

All documents, operational & maintenance manuals, inspection test procedure, drawings and other deliverables shall be supplied to the Employer’s Representative of Kolkata Metro, 1 month before the despatch of the machine.
Any parts of the equipment that is damaged shall not be considered as delivered unless repairs or replacements have been made. **Contractor’s local associate shall take over all the materials on arrival of when machine at the site and he shall takes care the machine/materials till the time the machine gets installed and commissioned at site by the contractor in all respect.**

6.0 **Document Submission**

All documents shall be provided in English. 4 sets of hard copy of documents & 2 soft copies per machine to be submitted by the contractor.

6.1 **For Execution of Builder’s Work**

The Contractor shall obtain Engineer’s consent on the interface and builder’s work requirement for installation of the equipment. The documents shall include the followings:

- Detailed dimensional builder’s works drawings and interface technical information including equipment operating loads, pit configuration, foundations, track base, cast-in items, electrical and mechanical provisions.
- Full detail drawings of the plinths in which the water and effluent are collected, and drained for treatment and re-circulation. The drawings shall indicate the surface gradients and falls, the maximum total volume to be retained in each plinth.
- Flow rates and discharge patterns of the effluent discharged to the ETP.

6.2 **For Execution of Work**

Prior to manufacture of equipment, the Contractor shall send the following documents:

- Detailed dimensional drawing of the foundations and anchoring of the elements of the machine, and dimensions of switchboards,
- A detailed technical note, indicating the weight of components and removable parts, and including a list of all parts with the respective sub-contractor’s references,
- General drawings, detailed assembly drawings and detailed drawings of mechanical parts,
- Descriptive and operating note,
- Detailed hydraulic and pneumatic diagrams with markings,
- Detailed electrical diagram for troubleshooting including cable index,
- Control scheme, circuit diagram, flow chart of software, & logic diagram.
- Connection diagram with markings,
- List of basic spare parts recommended to be kept in stock for repairs,
- Documentation, drawings, notes and references of sub-contractors,
- Installation and commissioning procedure,
- Schedule for execution of work,
- Characteristics of the recommended cleaning products.

6.3 **At Completion of Work**

The Contractor shall provide the entire documentation, up to date:
- The list of general drawings and detailed drawings of electronic and electrical diagrams with complete nomenclature,
- The general nomenclature of the supply including sub-contractors,
- Mechanical drawings and electrical diagrams required for maintenance and troubleshooting of the machine,
- Illustrated lists of mechanical and electrical parts itemised in accordance with the diagrams and drawings mentioned above and including the addresses of the various contractors,
- Maintenance and adjustment manual with summary of circuits and functions and among other information, a lubrication manual including location of lubrication points, type of lubricants along with technical specification & Indian equivalent, frequencies and quantities,
- An operating manual (start up and user's instructions),
- Complete documentation of equipment from sub-contractors, & parts catalogue.
- Complete documentation on motors, pumps and major components,
- Spare part list with quantities for three years after handover of the Works, anticipated frequency of replacement and prices with a one-year validity period,
- Set of service and special tools.
- Manual for hardware & software tools required for making changes in the application software
- Spare parts catalogue
- Vendor details

7.0 Training

The Contractor shall submit to the Employer's Representative for review and approval a training plan at least 2 months before the readiness of the equipment for commissioning. The training shall be in two stages in the depot in Kolkata Metro:

a. The contractor shall provide hands on training to Employer's staff of minimum 10 trainer man-days at site after commissioning of plant. The training shall focus on the following subjects to well verse the O&M staff with the machine design & assembly aspects:

i) Full exposure to assembling stages of the plant for understanding the sequential integration of the subassemblies and systems including electrical interface
ii) Interfacing on of the plant safety features and interlocking
iii) Interactive sessions for the preparation of training material to be despatched and all other similar activities, which can enhance operational & maintenance skills of the employer's staff.

b. The contractor shall provide following training of total 20 trainee man day's to the employers staff on operation & maintenance aspects of fully automatic train wash plant at the nominated Depot.

i) The operation training shall cover:
   1. Complete operation cycle of the plant & all features including safety features.
   2. Minor fault diagnostic & there quick remedial

   ii) The training on maintenance aspect of the plant shall cover:

   1. Training on general maintenance, replacement of faulty parts of different subsystems of the machine e.g. pneumatics, lubrication system, electrical, control electronic and its controls including PLC programming software reloading & backup etc.
2. Checking of all interlocking & safety features/systems available in the machine and fault attending
3. Training on Proactive, predictive and breakdown maintenance aspects of the machine based on past experience of the instructor.

8.0 Maintenance

The equipment shall be maintained for the scheduled and unscheduled repair by the successful tenderer during the defect liability period (DLP) of 24 months from the date of handing over of installed & commissioned plant to the employer. Tenderer shall submit in the offer, details / organization how to carryout the maintenance during this defect liability period. Separate head of payment for it is indicated in the bid. Payment against it shall be made on quarterly basis subject to issuance of certificate by engineer in charge on the basis of satisfactory maintenance & availability of spares and consumables for schedule maintenance& valid competency certificate of maintenance engineer issued by the contractor (OEM).

The contractor shall clearly describe the scope of ‘Preventive Maintenance’ if any, if required then contractor shall furnish the details of weekly, monthly, quarterly and yearly activities are required for the Preventive Maintenance’ of plant’s assemblies & sub-assemblies.

The tenderer shall have to meet with the time frame for breakdown/corrective maintenance mentioned below: -

   a. Response Time (Max) - 12 hours
   b. Attention: Time (Max) - 24 hours after expiry of response time.

Delay in attending defects on the part of the contractor will invite penalty @ Rs5000 per day subject to limit of 10 % of the contract price as specified in clause no C13.2 of condition of contract. The calculation of the delay will start on expiry of maximum allowable attention time for both minor & major defects.

The contractor shall maintain bank of spares with KOLKATA METRO to optimise the machine down time. The contractor shall themselves arrange any transportation, loading/unloading, spares, lubricant & other consumables, machinery & plants, tools/ tackles, labour, garbage disposal etc. required for attending break down/ maintenance of the machine.

8.1 Warranty

i. The plant along with all its sub systems shall be under warranty for repairs /replacement by the contractor during the defect liability period (DLP) of 24 months from the date of commissioning of Automatic train wash pant FOR KOLKATA METRO. The contractor shall do the unscheduled maintenance of the Automatic train wash pant for a period of 24 months from the date of commissioning of Automatic train wash pant FOR KOLKATA METRO).

9.0 Spares

Contractor shall provide spares as mentioned below: -

i. Consumable spares & spares for schedule maintenance.
ii. Recommended spares.

9.1 **Spares & Consumables for schedule maintenance:**

Tenderer shall provide all the consumable spares at employer’s work for the smooth functioning of plant and also any of the spares required for scheduled maintenance and unscheduled repair of plant during Defects liability period, free of cost (FOR KOLKATA METRO). Tenderer shall give a list of spares to be maintained by him at employer’s works for the scheduled maintenance and unscheduled repair of equipment during DLP in the technical packages. If spares provided fall short than the requirement or which are not included in the list but shall be required during DLP, it shall be made available by the supplier at his cost at the earliest. The contractor’s payment shall not be entertained without the physical supply of DLP spares as per list.

9.2 **Recommended spares:**

Tenderer shall quote for recommended spares for the plant (FOR KOLKATA METRO). The price offered shall remain valid for a period of 2 years beyond DLP. KMRCL at its sole discretion reserve the right to purchase of recommended spares. The price quoted for recommended spares will be part of evaluation.

9.3 **Part catalogue**

Tenderer shall provide part catalogue containing details all equipments & supplier. The first subsection shall be on alphanumeric part list, which shall include:

- Part no.
- Description.
- Name of manufacturer with contact details.
- Quantity & unit.
- Part of next higher assembly.
- Cross reference to figure no.
- General or specific purpose.
- Purchase & technical specification for every item of Auto wash plant in Kolkata Metro.

10.0 **SCHEDULE OF KEY DATES**

<table>
<thead>
<tr>
<th>Key date no.</th>
<th>Requirement</th>
<th>Key date</th>
</tr>
</thead>
<tbody>
<tr>
<td>KD – 1</td>
<td>Obtain Engineer’s consent on the builder’s works drawings and interface technical information.</td>
<td>Week 5</td>
</tr>
<tr>
<td>KD – 2</td>
<td>Obtain Engineer’s consent on the design &amp; drawings</td>
<td>Week 10 After KD1</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>KD – 3</td>
<td>Complete supply of the cast – in items to designated contractor for fixing (if any), supply of DLP spares and the Train Washing Plants, supply of mandatory spares.</td>
<td>Week 20 After KD2</td>
</tr>
<tr>
<td>KD – 4</td>
<td>Complete installation, testing and commissioning, integrated commissioning of the Train Washing Plants and other obligations.</td>
<td>Week 12 After KD3</td>
</tr>
</tbody>
</table>

All Key Dates are subject to Liquidated Damage. The dates given above are the week numbers after the Commencement Date of the supply Contract / Letter of Acceptance.
11.0 SCHEDULE OF ACCESS DATES

11.1 SCHEDULE OF ACCESS DATES for CENTRAL PARK DEPOT OF KOLKATA METRO

The table below sets out the access dates when Site Areas will be made available to the Contractor together with the dates by which they must be vacated by the Contractor. These should be taken into account in the works programme.

<table>
<thead>
<tr>
<th>Site areas</th>
<th>Access date</th>
<th>Vacate date</th>
<th>Reason for vacation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The area for train washing plant</td>
<td>Week 35 after KD1</td>
<td>Week 47 after KD1</td>
<td>Completion of the train wash plant</td>
</tr>
</tbody>
</table>

The precise duration and location of access requirements shall be developed and be mutually acceptable to the Contractor and Designated Contractor all as required by General Specification.

The areas of the Site to which the interface access dates apply are indicated within the Schedule of Access Dates, Specification and Drawings.

Not less than two weeks or an appropriate period before access is due and on the date for access to an area of interface, the Contractor, the relevant Designated Contractor, the Engineer and / or Relevant Authority shall inspect, assess, confirm and record the state of readiness achieved to the permanent works, temporary works, access arrangements and provision of attendance.

The following inspection records of the findings shall be kept by the Designated Contractor and Contractor and submitted to the Engineer on the day of inspections:-

(a) Quality records confirming satisfactory completion of the work by the Designated Contractor.

(b) A detailed list of outstanding work.

(c) Sketch of access routes to the work area.

(d) Other relevant records.
12.0 INTERFACE AND COORDINATION

12.1 Interface with Designated Depot Civil Contractor (s)

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Train wash plant Contractor</th>
<th>Designated Depot Civil Contractor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of machinery and plant</td>
<td>Supply of detailed interface drawings including detail foundations, wash pit, and other civil works, electrical power requirements, water and waste water/ effluent to be drained requirements etc.</td>
<td>(Detailed design, consultant shall prepare the structural, architectural and E&amp;M work drawings based on the information supplied)</td>
</tr>
<tr>
<td>Civil Works</td>
<td>Supply of cast in items. The cast in items shall include any base plates fixing bolts &amp; other for Installation of equipment. Installation of Machinery &amp; Plant including all pipe lines and plumbing works.</td>
<td>Construction of the wash pits, foundations, pit drainage and other civil work required for equipment/ machine. Positioning and casting of cast in items supplied by Equipment supplier. Temporary/ Permanent Road approach to the workshop.</td>
</tr>
<tr>
<td>Water supply &amp; Drainage</td>
<td>Requirement of water supply and effluent discharge</td>
<td>To provide water supply and drainage point connection as per requirement furnished by equipment supplier.</td>
</tr>
</tbody>
</table>

12.2 Interface with Designated E&M Work Contractor

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Train wash plant Contractor</th>
<th>E&amp;M Work Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical works</td>
<td>All electrical work from connection point for electric power supply provided by Civil &amp; Electrical designated contractor. Provide certificate conforming work completion certificate conforming to statutory requirements to certify that the installation of the electrical system as installed under the contract meets the requirement of</td>
<td>Provision of electrical connections. The conduiting/ cable trench requirement from wash plant to DCC.</td>
</tr>
</tbody>
</table>
12.3 **Interface with Designated Track Work Contractor**

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Train wash plant Contractor</th>
<th>Track Work Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track work inside the washing plant</td>
<td>Co-ordinate with <strong>Track Work Contractor</strong> for track laying programme &amp; track alignment. Connection of drainage to drain point</td>
<td>Give programme of track laying inside washing plant area provide information about track alignment to Equipment supplier.</td>
</tr>
</tbody>
</table>

12.4 **Interface with Rolling Stock Contractor**

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Train wash plant Contractor</th>
<th>Rolling Stock Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of wash plant for Metro Cars &amp; for suitability of detergent.</td>
<td>Design manufacture and supply the wash plant to suit the Rolling Stock</td>
<td>Provide Rolling Stock dimensions, profile and other details to design wash plant. And also provide the details of detergent to be used</td>
</tr>
</tbody>
</table>

12.5 **Interface with Designated Signaling Contractor**

<table>
<thead>
<tr>
<th>Scope of work</th>
<th>Train wash plant Contractor</th>
<th>Signaling Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control console at DCC for wash plant.</td>
<td>Provide control console at DCC and complete wiring from wash plant to control console.</td>
<td>Provision of interface drawings for DCC layout for wash plant panel location.</td>
</tr>
</tbody>
</table>
TENDERER’S TECHNICAL PROPOSALS

The Tenderer shall submit documents for EACH of the numbered items in the following paragraphs to enable evaluation of the Technical Proposals. Each of the numbered items shall be addressed with either submission of documentation or confirmation of “not applicable”. The Tenderer shall include any further information necessary to demonstrate the suitability of his proposal. Offer shall be submitted with information against each of the specified items.

Tenderer also submit all the informations as required, mentioned in particular specifications against each clause.

<table>
<thead>
<tr>
<th>A. General</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A list of all subassemblies, accompanied with brief technical descriptions.</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>A list stating limitations, conflicting requirements and non-compliance of the offered equipment in respect to the specified equipment</td>
</tr>
<tr>
<td>A3</td>
</tr>
<tr>
<td>A proposal of, if any, technical alternatives to the Employer’s Requirements in the format given in PS. The cost implications shall be given in mentioned Statement.</td>
</tr>
<tr>
<td>A4</td>
</tr>
<tr>
<td>Brief plans for delivery, Testing and Commissioning of Plant and Equipment.</td>
</tr>
<tr>
<td>A5</td>
</tr>
<tr>
<td>Method of interfacing and final integration of equipment with relevant Designated Contractors.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B Description of Offered Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
</tr>
<tr>
<td>A detailed technical note including description of the equipment and all important assemblies, main dimensions of the equipment etc.</td>
</tr>
<tr>
<td>B2</td>
</tr>
<tr>
<td>Sufficient drawings to make a reasonable assessment of:-</td>
</tr>
<tr>
<td>(i) The equipment as a whole</td>
</tr>
<tr>
<td>(ii) The working system</td>
</tr>
<tr>
<td>B3</td>
</tr>
<tr>
<td>References and characteristics of main parts,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C Spare Parts, Special Tools, Test Equipment and Maintenance Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
</tr>
<tr>
<td>Lists of spare parts for commissioning and defect liability period special tools and test equipment as part of the scope of supply under the Contract.</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>A list of spare parts for 10-year operation shall be submitted as recommended spares, in the Form attached with the names of suppliers and/or local agents, anticipated frequency of replacement, delivery periods for re-ordering, recommended quantities and prices with validity up to the commencement of the Defects Liability Period.</td>
</tr>
<tr>
<td>C3</td>
</tr>
<tr>
<td>For firms out of KOLKATA or foreign firms, the details of the local maintenance office including:</td>
</tr>
<tr>
<td>Company profile;</td>
</tr>
<tr>
<td>Maintenance facilities in KOLKATA;</td>
</tr>
<tr>
<td>Number of years maintaining similar equipment/machines/plant</td>
</tr>
<tr>
<td>Repair arrangement for faulty components on emergency basis.</td>
</tr>
</tbody>
</table>

## D Contractor’s Organisation

| D1 | The Tenderer shall demonstrate his capabilities to manufacture offered equipment. |

| D2 | The details of the Tenderer including the following: |
|    | Company profile; |
|    | Date of formation of company; |
|    | Relevant registered license; |
|    | Number of years of manufacturing similar equipment; |
|    | List of references where similar equipment has been supplied along with performance certificate. |
|    | Sample submission documents, which are extracted from their previous similar projects, include design drawings and testing procedures. |

| D3 | The details of the Principal Manufacturer including the following: |
|    | Manufacturer’s Company profile; |
|    | **Country of origin:** |
|    | Equipment catalogues of items offered; |
|    | Number of years manufacturing similar equipment; |
|    | Number of years supplying similar equipment; |
|    | A list of references including project title, year of project, employer’s name and references of the sub-contractors; |
STATEMENT OF DEVIATIONS

REFER ANNEXURE -5(a)
Deviations, Conditions, Qualifications etc.

REFER ANNEXURE -5(b)
Technical Alternatives

REFER ANNEXURE -5(c)
TENDERER'S LETTER HEAD

To: 
THE MANAGING DIRECTOR
KOLKATA METRO RAIL CORPORATION LTD
3rd FLOOR, KMRCL BHAWAN
MUNSHI PREMCHAND SARANI
KOLKATA- 700021

Date:

LETTER OF UNDERTAKING

DESIGN, MANUFACTURING, SUPPLY, INSTALLATION, TESTING & COMMISSIONING AND TRAINING (INCLUDING INTEGRATED TESTING AND COMMISSIONING) OF AUTOMATIC TRAIN WASHING PLANT FOR KOLKATA METRO RAIL CORPORATION LIMITED.

TENDER NO- ATWP

We ............... hereby undertake that incase of our being the preferred bidder we would set up maintenance facility in Kolkata either directly or through local associate company, who shall be having at least 3 years experience of manufacturing the machine for railways/metros application or of giving after-sales service for machine used in railways/metros. We commit to maintain at least 2 trained and skilled engineers for each plant, for catering to complete maintenance requirement of KOLKATA METRO RAIL CORPORATION LIMITED as per the specification.

We shall certify the competency of the trained manpower deputed for the purpose of maintenance during DLP period, as specified in the tender documents

Signed: ..............................
For and on behalf of
(Name of Tenderer/Joint Venture)
NOT USED
APPENDIX- D

NOT USED
APPENDIX -E

TENDER No. ATWP

STRUCTURE OF THE TENDERER

The Tenderer shall supply a chart particularising the structure of the Tenderer (identifying all companies comprising the Tenderer in the event that the Tenderer is a joint venture or consortium) and the ownership of each of the companies comprising the Tenderer, identifying all respective intermediate and ultimate holding companies.

COMPOSITION OF THE TENDERER

1. A notarised copy of Memorandum of Understanding (MOU) relating to the composition of the Tenderer shall be submitted. For guidance, if the Tenderer is a joint venture or a consortium then the joint venture or consortium agreement is to be submitted by the Tenderer. Should the Tenderer be an entity established or to be established to tender for this Contract, details of the shareholders’ agreement or proposed shareholders’ agreement shall be supplied together with the percentage participation and percentage equity in the agreements.

2. The contractual arrangements and copies of agreements in relation thereto must, as a minimum, provide information on all members or participants involved, their respective participation in the Tenderer, the management structure, ownership and control of the members or participants comprising the Tenderer and if, appropriate, the name of the member or participant who would have overall lead management responsibility for the Works, the registered addresses of all parties and the names of their respective senior partners, chairmen or managing directors as appropriate. Such agreements should also reflect the joint and several liabilities of the members to the Employer in the event that the Contract is awarded to them and provide "deadlock" provisions in the event that decisions of the joint venture or consortium cannot be reached by unanimous agreement.

3. The Tenderer shall provide written confirmation that:

   (a) The agreement or agreements submitted represent the entire agreement between the members or participants comprising the Tenderer as to the Tenderer's legal persona;

   (b) There is or are no other agreements relating to the Tenderer's incorporation, powers or organization which may affect in any way his ability to carry out the Works; and

   (c) No changes will be made to any such agreements during the tender period or during the contract period (if contract awarded) without first obtaining the Employer's agreement to the proposed change or changes.
FORM OF CERTIFICATE CONFIRMING RECEIPT OF ALL TENDER ADDENDA

This is to certify that we, M/S [* Name of the Company] have received all Tender Addenda to Tender No- ........... , as listed below:

1. Addendum No.
2.
3.
4. ..............................................

SIGNATURE OF TENDERER

* In case of a joint venture or consortium, to be submitted by each constituent member.
FORM OF CERTIFICATE CONFIRMING CAREFUL EXAMINATION OF ALL THE CONTENTS OF TENDER DOCUMENTS AND SIGNING OF ALL PAGES OF TENDERER’S PROPOSAL

This is to certify that we, M/S [*Name of the company] have carefully examined all the contents of the Tender Documents including Tender Addenda (if any) and all the pages of our proposal have been signed and stamped (by each constituent member in case of a joint venture or consortium).

SIGNATURE OF TENDERER

*In case of a joint venture or consortium, to be submitted by each constituent member.
1. **CONTRACT CONDITIONS:**

1. Amount of Performance Guarantee (CoC Sub-Clause C9.0)  
   10% of the Contract Price as in COC

2. Liquidated Damages (CoC Sub-Clause C13.2)  
   As in COC

3. Warranty (CoC Sub-Clause C28.0)  
   As in COC

4. Earnest Money/ Tender Guarantee  
   Earnest Money/ Tender Security of INR 9,00,000/- (Indian Rupee Nine lakh only) or USD 18000 (USD Eighteen Thousand only) as mentioned in Instruction to Tenderers (Clause T5.0) is required along with the offer.

5. Delivery Schedule  
   As per Particular specification.

6. Contractors Name & Address**

7. Employers Name & Address  
   Kolkata Metro Rail Corporation Ltd.  
   3rd Floor, KMRCL Bhawan,  
   Munshi Premchand sarani  
   Kolkata-700021

8. Contract Period  
   As per Particular

2. **UNPRICED ITEMS**

   Items against which no rate or sum is entered by the Tenderer, whether quantities are stated or not, shall be regarded as covered by other rates in the Statement of Prices/Tender Pricing. The Tenderer shall take regard of the actual site conditions and the items entered in the various statements. The Tenderer shall price his tender accordingly and the unit prices entered against a line item shall be the full and only price paid for all work performed against that item except as described in the Tender Documents.

3. **TERMS OF PAYMENT**  
   As mentioned in clause C18.0 of "Conditions of Contract". **(Tenderer to Complete)**

4. **TENDER No. ATWP**
FORM OF DECLARATION FOR NON-ENGAGEMENT OF ANY AGENT, MIDDLEMAN OR INTERMEDIARY

TENDER No. ATWP

We hereby jointly and severally declare that the submission of this Tender confirms that no agent, middleman or any intermediary has been, or will be engaged to provide any services, or any other item or work related to the award and performance of this Contract. We further confirm and declare that no agency commission or any payment which may be construed as an agency commission has been, or will be paid and that the tender price does not include any such amount. We acknowledge the right of the Employer, if he finds to the contrary, to declare our Tender to be non-compliant and if the Contract has been awarded to declare the Contract NULL and VOID.

SIGNATURE OF THE TENDERER
TENDER No. ATWP

APPENDIX-J

<table>
<thead>
<tr>
<th>No</th>
<th>Financial Information in Rupee equivalent</th>
<th>Last Financial Year</th>
<th>Exchange rate</th>
<th>Rupee Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>i.e from ___ to ___</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>In respective currencies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Total Assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Total Liabilities (excluding Shareholder’s funds including reserves and surplus)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Shareholder’s Funds or Net worth (Net Worth=Total assets at S.No.1— Total Liabilities at S.No.2 above)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This information should be extracted from the Annual Financial Statements and Banking Reference. (The information should be duly certified Fab and signed by the qualified Chartered Accountant)

NOTE: The exchange rate, wherever mentioned, in this questionnaire shall be taken as the ‘B.0 Selling Rate of Exchange of the currencies at the close of business of the State Bank of India’, applicable on the respective financial year ending date.

Signature of Chartered Accountant  
Signature of Tenderer
ANNEXURES (1 TO 9)
## TENDERER's FINANCIAL OFFER for The PACKAGE

### STATEMENT OF PRICES for Supply within India

<table>
<thead>
<tr>
<th>SN.</th>
<th>Item Description</th>
<th>Qty</th>
<th>Ex Works basic Rate/unit</th>
<th>Excise Duty</th>
<th>CST/ VAT/ West Bengal VAT (applicable tax may be ticked)</th>
<th>Freight charges if any</th>
<th>FOR Rate/unit incl. of all</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>Supply Part</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Supply of Automatic Train Washing Plant with specification as given in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Supply of recommended spares required as mentioned in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td><strong>Service part</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Erection, Testing &amp; commissioning, integrated commissioning of Automatic Train Washing Plant</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O &amp; M documentation and training to employer's staff and other obligations as mentioned in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Maintenance of Automatic Train Washing Plant for 24 months of DLP (defects liability period).</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Total Price (1+2+3+4+5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Above items are required strictly as per specifications given in Particular specifications.
2. The above prices shall be FOR destinations basis at Kolkata Metro site within Kolkata.
3. Quoted price against S.No. '5' above shall be more than or equal to 5% of the total quoted price against S.No. '1' to '4'. In case quoted price for item no. 5 is found less than 5% of the total price against item no. '1' to '4' then offered price for item no.
5 will be loaded up to 5% of total price of items No. '1' to '4' for financial evaluation. Also in such case the rates offered against sl. No. '1' to '4' will be reduced on pro-rata to ensure that price against S.No. '5' is at least 5% of total price of items No. '1' to '4'. Payment for item no. '1' to '4' will also be made accordingly.

4. On supply items applicable CST/VAT/West Bengal VAT and on services, service tax may be clearly indicated. These are payable only when tenderer indicate these in their offer clearly. For interstate supplies no 'C'I'D' form shall be issued.

5. Payment related to local services if any such as Erection, testing & commissioning, integrated commissioning, O&M documentation, training to employer's staff and Maintenance during DLP shall attract Tax Deduction at Source under the income tax regulations as applicable.

6. For indigenous supply, tenderer shall quote their rates on final destination basis. Evaluation of offers will be made on FOR destination incl. of all taxes and duties except West Bengal VAT for local supply from West Bengal.

Date: ............................................................(Signature) ........................................

Place: ......................

Printed Name - .......-

Designation -------

Common Seal..............
# TENDERER’s FINANCIAL OFFER for The PACKAGE

## STATEMENT OF PRICES for Supply from ABROAD

<table>
<thead>
<tr>
<th>SN.</th>
<th>Item Des</th>
<th>Qty</th>
<th>Currency</th>
<th>Unit Price (FOB port of dispatch)</th>
<th>Unit price of Sea freight &amp; inland haulage charges from port of dispatch to ICD/Kolkata, (West Bengal, India)</th>
<th>C &amp; F Rate/unit</th>
<th>Total C &amp; F Price</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Supply part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Supply of Automatic Train Washing Plant with specification as given in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Supply of recommended spares required as mentioned in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Service part</td>
<td></td>
<td></td>
<td>Rate/unit</td>
<td>Service Tax</td>
<td>Rate/unit incl of all</td>
<td>Total Amount</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Erection, Testing &amp; commissioning, integrated commissioning of Automatic Train Washing Plant</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O &amp; M documentation and training to employer’s staff and other obligations as mentioned in Particular specifications.</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Maintenance of Automatic Train Washing Plant for 24 months of DLP (defects liability period).</td>
<td>01 Set</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Total Price (1+2+3+4+5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Above items are required strictly as per specifications given in Particular specifications.

2. For overseas manufacturer, the price should be on FOB port of dispatch basis & C&F ICD Kolkata (West Bengal, India) basis. Offer without freight charges will be loaded with highest rate of freight charges received against the tender.
3. Quoted price against S.No. '5' above shall be more than or equal to 5% of the total quoted price against S.No. '1' to '4'. In case quoted price for item no. 5 is found less than 5% of the total price against item no. '1' to '4' then offered price for item no. 5 will be loaded up to 5% of total price of items No. '1' to '4' for financial evaluation. Also in such case the rates offered against sl. No. '1' to '4' will be reduced on pro-rata to ensure that price against S.No. '5' is at least 5% of total price of items No. '1' to '4'. Payment for item no. '1' to '5' will also be made accordingly. In case of foreign offer 5% value for item no. '5' shall be evaluated without sea freight & inland haulage charges.

4. For overseas supply, evaluation of offers will be done on CIF + 1% landing charges + total concessional Custom duty (including ACD, CVD & CESS etc.) as applicable under project import on (CIF + 1%) basis+ Service tax if any applicable. Insurance charges will be loaded @ 0.25% of C&F value.

5. Payment related to local services if any such as Erection, testing & commissioning, integrated commissioning, O&M documentation, training to employer's staff and Maintenance during DLP shall attract Tax Deduction at Source under the income tax regulations as applicable.

6. In case of foreign offer, if the service provider does not have permanent establishment in India and do not quote the service tax, the applicable service tax has to be deposited by the service receiver (purchaser) on reverse charge basis. Therefore, the service tax on service portion on the foreign offers will be considered inclusive in the quoted rates as applicable on the due date of submittal of tender. In this case, payment will be made after deducting the service tax that will be paid by service receiver (purchaser).

Date: .................................................................................................................................(Signature) ......................

Place: .................................................................................................................................Printed Name--------

------------Designation

Common Seal------------
**PAST PERFORMANCE OF BIDDER**

Tender No ........................................................................ Date of opening...

1. Ref Para B of Initial filter criteria
   Details of orders for design manufacture and supply of AUTOMATIC TRAIN WASHING PLANT executed during the past five years.

<table>
<thead>
<tr>
<th>SI no</th>
<th>Full address of purchaser with contact name and telephone Nos</th>
<th>Order No_ and Date</th>
<th>Machine particulars</th>
<th>Qty</th>
<th>Date of supply</th>
<th>Date of commissioning</th>
<th>Commissioning certificate/ purchase order copy without price to be attached in proof in commissioning/delivery.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Ref Para 1(ii): Performance certificate from users with specified details

3. Ref Para 1.1 : The manufacturing unit where the AUTOMATIC TRAIN WASHING PLANT shall be manufactured and credentials of manufacturing such plants for number of such plants manufactured and their performance report.

   Signature...........................................................

   Name...........................................................................

   Designation...........................................................
INSTRUCTIONS TO TENDERER

FORM OF BANK GUARANTEE FOR TENDER SECURITY

(To be stamped in accordance with Stamp Act, if any, of the country of issuing bank)

KNOW ALL MEN by these presents that we ______________________________ (Name of Bank) in India, having our registered office at ______________________________ (hereinafter called "the Bank") are bound unto KOLKATA METRO RAIL CORPORATION LIMITED (hereinafter called "the Employer") in sum of Rs.___________________________ for which payment well and truly to be made to the said Employer, the Bank binds himself, his successors and assigns by these presents.

WHEREAS _____________________ (Name of Tenderer) (hereinafter called "the Tenderer") has submitted his tender dated __________ for Contract ATWP (hereinafter called "the Tender").

WHEREAS the Tenderer is required to furnish a Bank Guarantee for the sum of Rs. ______________ (Amount in figures and words) as Tender Guarantee against the Tenderer's offer as aforesaid.

AND WHEREAS ________________________ (Name of Bank) have, at the request of the Tenderer, agreed to give this guarantee as hereinafter contained.

We further agree as follows:

(i) That the Employer may without affecting this guarantee grant time or other indulgence to or negotiate further with the Tenderer in regard to the conditions contained in the said tender and thereby modify these conditions or add thereto any further conditions as may be mutually agreed upon between the Employer and the Tenderer.

(ii) That the guarantee herein before contained shall not be affected by any change in constitution of our Bank or in the constitution of the Tenderer.

(iii) That this guarantee commences from the date hereof and shall remain in force till:

(a) The Tenderer, in case his tender is accepted by the Employer, executes a formal agreement after furnishing the Performance Security on Scheduled Commercial Banks (including Scheduled Commercial Foreign Banks) or

(b) Twenty eight days after the date of validity or the extended date of validity of the Tender, as the case maybe;

whichever is earlier.

(iv) That the expression "the Tenderer" and the "the Bank" herein used shall, unless such an interpretation is repugnant to the subject or context, include their respective successors and assigns.
THE CONDITIONS of this obligation are:

(i) if the Tenderer withdraws his Tender during the period of Tender validity specified in the Form of Tender, or

(ii) if the Tenderer refuses to accept the corrections of errors in his Tender, or

(iii) if the Tenderer having been notified of the acceptance of his Tender by the Employer during the period of tender validity:

   (a) fails or refuses to furnish the Performance Security and/or

   (b) fails or refuses to enter into a Contract within the time limit specified in paragraph T12.4 of the "Instructions to Tenderer"

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of any one or more of the conditions (i), (ii), (iii) a or (iii) b mentioned above, specifying the occurred condition or conditions.

Signature of
Authorised Official
Of the Bank:

______________________________

SIGNATURE OF WITNESS

______________________________

Name of Official:

______________________________

Designation

______________________________

NAME OF WITNESS

STAMP/SEAL OF BANK

Address of witness
PROFORMA FOR AUTHORITY FROM MANUFACTURERS

No. ................................................................. Date .................................

To
Managing Director,
Kolkata Metro Rail Corporation Ltd.,
3rd Floor, KMRCL Bhawan,
Munshi Premchand Sarani
Kolkata-700021

Dear Sir,

Sub :-

We ................................................................., an established and reputable manufacturers of .......................................................... having factories at ................................................ and offices at ............................................................... do hereby authorise M/s (Name and address of Agents) to represent us, to bid, negotiate and conclude the contract on our behalf with you against Tender No.

No company/ firm or individual other than M/s .............................................................are authorised to represent us in regard to this business against this specific tender.

Yours faithfully,

(NAME) for & on behalf of M/s...............................
(Name of Manufacturers)

Note : This letter of authority should be on the Letter-Head of the manufacturing concern and should be signed by a person competent and having the power of attorney to bind the manufacturer.
ANNEXURE 5 (a)

PROFORMA FOR STATEMENT OF TECHNICAL DEVIATIONS

<table>
<thead>
<tr>
<th>Title</th>
<th>Clause Number</th>
<th>Details of Deviations</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. We hereby confirm that the pricing for unconditional withdrawal of the above deviations has been given in Annexure-5(b) in the Financial Tender.
2. We hereby confirm that all implicit and explicit deviations, comments and remarks, mentioned elsewhere in our Tender, shall be treated as NULL and VOID and stand withdrawn.
3. We hereby confirm that but for the deviations noted in the Annexure — 5(a) & 5(b), our Tender is fully and fully compliant.

Date .................................................. (Signature) ..........................................................

Place ......................................................(Printed Name)..................................................

(Designation) ..........................................

(Common Seal) ............................

NOTE: Where there is no deviation, the statement should be returned duly signed with an endorsement indicating "No Deviations".
PROFORMA FOR STATEMENT OF TECHNICAL DEVIATIONS WITH COST OF UNCONDITIONAL WITHDRAWAL OF DEVIATIONS

1. We hereby confirm that the pricing for unconditional withdrawal of the above deviations has been given in the Financial Tender.
2. We hereby confirm that all implicit and explicit deviations, comments and remarks, mentioned elsewhere in our Tender, shall be treated as NULL and VOID and stand withdrawn.
3. We hereby confirm that but for the deviations noted the Annexure 5(a) & 5(b), our Tender is fully and fully compliant.

In case price for unqualified withdrawal of any remark, comment, condition, qualification or deviation etc. indicated in Annexure -5(a) is not quoted in financial tender as per Annexure-5(b), it shall be considered that the remark, comment, condition, qualification or deviation is unconditionally withdrawn without any financial implication. However, Employer at its sole discretion and option may assess the financial implication of the said remark, comment, condition, qualification or deviation etc. based on best engineering principles and concepts, which shall be binding on the tenderer, and the same may be considered by Employer for financial evaluation.

Date .........................................................(Signature)

Place ...........................................................(Printed Name)..............................................................

(Designation)..........................................................

(Common Seal)............................

NOTE: Where there is no deviation, the statement should be returned duly signed with an endorsement indicating "No Deviations".
To,

Kolkata Metro Rail Corporation Limited

Dear Sir,

Our prices given in Statement is firm and fixed for a fully complying proposal. Itemised Technical Alternatives are priced in this Statement and have been carefully described as being a Technical Alternative.

The price entered represents the adjustment (increase or decrease) to be made to the total of the appropriate line item should the relevant Technical Alternative be accepted by the Employer. The adjustment has been clearly identified for each Statement.

<table>
<thead>
<tr>
<th>Line Item</th>
<th>Technical Alternative</th>
<th>Price Increase or Decrease (Currency)</th>
</tr>
</thead>
</table>

Date ............................................................... (Signature) ..............................................................

Place ............................................................. (Printed Name) ............................................................
  (Designation) ..........................................................

(Common Seal).................................................
ANNEXURE-6 (a)

PROFORMA FOR STATEMENT OF TECHNICAL DEVIATIONS ON COMMERCIAL CONDITIONS

1. We hereby confirm that the pricing for unconditional withdrawal of the above deviations has been given in Annexure-6(b) in the Financial Tender.

<table>
<thead>
<tr>
<th>Title</th>
<th>Clause Number</th>
<th>Details of Deviations</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. We hereby confirm that all implicit and explicit deviations, comments and remarks, mentioned elsewhere in our Tender, shall be treated as NULL and VOID and stand withdrawn.

3. We hereby confirm that but for the deviations noted in the Annexure 6(a) & 6(b), our Tender is fully and fully compliant.

Date ........................................................................... (Signature) .................................................................

Place ........................................................................... (Printed Name) .................................................................

(Designation).............................................................................................

(Common Seal)...............................

NOTE : Where there is no deviation, the statement should be returned duly signed with an endorsement indicating “No Deviations”. 
ANNEXURE-6 (b)

PROFORMA FOR STATEMENT OF TECHNICAL DEVIATIONS ON COMMERCIAL CONDITIONS WITH COST OF UNCONDITIONAL WITHDRAWAL OF DEVIATIONS.

<table>
<thead>
<tr>
<th>Title</th>
<th>Clause Number</th>
<th>Details of Deviations</th>
<th>Price for deviation withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. We hereby confirm that the pricing for unconditional withdrawal of the above deviations has been given in the Financial Tender.

2. We hereby confirm that all implicit and explicit deviations, comments and remarks, mentioned elsewhere in our Tender, shall be treated as NULL and VOID and stand withdrawn.

3. We hereby confirm that but for the deviations noted in the Annexure 6(a) & 6(b), our Tender is fully and fully compliant.

In case price for unqualified withdrawal of any remark, comment, condition, qualification or deviation etc. indicated in Annexure -6(a) is not quoted in financial tender as per Annexure-6(b), it shall be considered that the remark, comment, condition, qualification or deviation is unconditionally withdrawn without any financial implication. However, Employer at its sole discretion and option may assess the financial implication of the said remark, comment, condition, qualification or deviation etc. based on best engineering principles and concepts, which shall be binding on the tenderer, and the same may be considered by Employer for financial evaluation.

Date ......................................................... (Signature) .................................................................

Place .......................................................... (Printed Name) ...........................................................

(Designation) ..........................................................

(Common Seal) .................

NOTE : Where there is no deviation, the statement should be returned duly signed with an endorsement indicating “No Deviations”. 
PERFORMANCE GUARANTEE

(COC Clause C9.0 refers)

(To be stamped in accordance with the Stamp Act of the Country of Issuing Bank)

To: KOLKATA METRO RAIL CORPORATION LIMITED, KMRCL Bhawan, Munshi Premchand Sarani, 3rd Floor, Kolkata 700 021.

WHEREAS ---------------- (Name and address of Design and Construct Contractor) (hereinafter called “the Contractor”) has undertaken, in pursuance of Contract ATWP to design, manufacture, supply, installation, testing & commissioning and training of personnel of Automatic Train Wash Plant for Central Park Depot of KOLKATA METRO RAIL CORPORATION LIMITED Contract ATWP (hereinafter called “the Contract”)

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee from a Schedule Commercial Bank in India acceptable to the Employer or an Indian Nationalised for the sum specified herein as security for compliance with his obligations in accordance with the Contract.

AND WHEREAS we (Insert name and address of Bank) have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor up to a total of ----------------- (amount of Guarantee)--------------------- (in words), such sum being payable in the types and proportion of currencies in which the Contract Price is payable and we hereby unconditionally, irrevocably and without demur undertake to immediately pay you, upon your first written demand and without cavil or argument any sum or sums within the limits of ------------ (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the contract or of the Works to be performed thereunder or of any of the contract documents which may be made between you and the Contractor shall in any way release us from any liability under the guarantee and we hereby waive notice of any such change, addition or modification.
The amount of Guarantee shall be reduced by half on completion of the Works as certified by the Engineer.

This guarantee shall be valid for 28 days after issue of Performance Certificate. The pendency of any dispute or arbitration or other proceedings shall not affect this guarantee in any manner.

SIGNATURE AND SEAL OF THE GUARANTOR

----------------------------------------------------------------

NAME OF BANK -------------------------------------- ---

ADDRESS --------------------------------------------------

DATE ------------------------------------ -------------------

Notes:
1. The stamp papers of appropriate value shall be purchased in the name of the Bank, which issue the ‘Bank Guarantee’
IMPORTANT NOTICE

(A) The following check list is intended to help the tenderers in submitting offer which are complete. An incomplete offer is liable to be rejected. Tenderers are advised to go through the list carefully and take necessary action.

(B) Tenderers are also required to submit copy of the checklist, duly marked, along with their offer.

CHECK LIST

1. Have you submitted a complete offer?
   It should consist of followings:
   (a) Quotation in prescribed Performa Annexure 1.
   Submitted / Not Submitted
   (b) Letter of Authority if required Annexure-4
   Submitted / Not Submitted
   (c) Tender Guarantee if required Annexure-3.
   Submitted / Not Submitted
   (d) Statement of Deviations from Tender Conditions Annexure-5 & 6
   Submitted / Not Submitted

2. Have you submitted other supporting documents to establish your eligibility?
   It may consist of the followings:
   (a) Documents relates to Initial filter criteria, Annexure-2, required numbers of Certificates from the user as per (Annexure-2) as per clause T4.0 of Instruction to Tenderers. All appendices from Appendix B to J
   Submitted / Not Submitted
   (b) Submission of offer as per ITT clause no-T6.0.
   Submitted / Not Submitted
   (c) Net worth statement Appendix-J, Income Tax Clearance Certificate
   Submitted / Not Submitted
   (d) Clause wise comments on Particular specification, ITT, CCC, SCC, as per Clause T2.2 "Instructions to Tenderers"
   Submitted / Not submitted
   (e) Any other document asked by the purchaser if submitted, specify the Documents
   OR
   Any other document which the tenderer Considers relevant.
   Submitted / Not Submitted

3. If you are a foreign firm have you submitted the detailed particulars of your agent and agency agreement- clause T3.3 of "Instructions to Tenderers"
   Submitted / Not Submitted

Signature & Seal of the Manufacturer/ Tenderer
ANNEXURE- 9

UNDEARTAKING FOR DOWNLOADING THE TENDER DOCUMENTS FROM WEBSITES

I/We have downloaded the Tender documents from the Internet site www.kmrc.in and I/we have not tampered / modified the Tender documents in any manner. In case, if the same is found to be tampered / modified, I/we understand that my/our Tender will be summarily rejected and the money deposited will be forfeited and I am/we are liable to be banned from doing business with KMRCL and/or prosecuted.

.............................................. Signature & Seal of the Manufacturer/ Tenderer
KOLKATA METRO RAIL CORPORATION LIMITED
EAST WEST METRO PROJECT

CONTRACT – ATWP

DESIGN, MANUFACTURE, SUPPLY, INSTALLATION, TESTING & COMMISSIONING AND TRAINING OF PERSONNEL OF AUTOMATIC TRAIN WASH PLANT FOR CENTRAL PARK DEPOT OF KOLKATA METRO RAIL CORPORATION LIMITED.

VOLUME 2

1. SCHEDULE OF DIMENSIONS (SOD)
2. DEPOT SITE DRAWING (282954/CPD/D/AR/SPN/2101)
3. DEPOT W/SHOP DRG (282954/CPD/C/AR/WKS/2200)
4. DEPOT STB-YARD DRG (282954/CPD/C/AR/STB/2300)
5. DEPOT ETU DRG (282954/CPD/C/AR/ETU/2401)

KOLKATA METRO RAIL CORPORATION LIMITED
3rd Floor, KMRCL Bhawan,
HRBC Office Complex
Munshi Premchand Sarani,
Kolkata 700 021
India
KOLKATA METRO RAIL CORPORATION LIMITED

SCHEDULE
OF
DIMENSIONS
FOR
STANDARD GAUGE
(1435 mm)
DRAFT January 2012

Document No. GCC-2010-ALL-DTP-SOD-100106-D02 dated 11.01.2012

KOLKATA METRO RAIL CORPORATION LIMITED
HRBC Bhawan,
Munshi Premchand Sarani,
4th Floor, Kolkata 700 021
India
SCHEDULE OF DIMENSIONS (STANDARD GAUGE, 1435 mm)

INDEX

PREAMBLE ........................................................................................................................................... 1

CHAPTER-1 GENERAL .......................................................................................................................... 2

1.1 SPACING OF TRACKS ....................................................................................................................... 2
1.2 CURVES ........................................................................................................................................ 2
1.3 BUILDINGS AND STRUCTURES ........................................................................................................ 2
1.4 KINEMATIC ENVELOPE .................................................................................................................. 4
1.5 STRUCTURE GAUGE ....................................................................................................................... 4
1.6 EXTRA CLEARANCES ON CURVES .................................................................................................. 4
1.7 MINIMUM TRACK SPACING ON CURVES ....................................................................................... 7
1.8 SPECIAL OPERATING CONDITIONS (COMMON FOR UNDERGROUND, ELEVATED AND AT GRADE) .................................................................................................................. 9
1.9 ADDITIONAL OPERATING CONDITION FOR ELEVATED AND AT GRADE SECTION ............... 9

CHAPTER-2 STATIONS .............................................................................................................................. 10

2.1 MINIMUM SPACING OF TRACKS AT STATIONS ........................................................................... 10
2.2 PLATFORMS .................................................................................................................................... 10
2.3 GRADIENTS ..................................................................................................................................... 11
2.4 INTERLOCKING AND SIGNAL GEAR ............................................................................................ 11
2.5 POINTS & CROSSING ..................................................................................................................... 12
2.6 SUPERELEVATION AND SPEED AT STATIONS ON CURVES WITH TURNOUTS OF CONTRARY AND SIMILAR FLEXURE .................................................................................. 12
2.7 ADDITIONAL CLEARANCE FOR PLATFORMS ON CURVES ....................................................... 13

CHAPTER-3 ROLLING STOCK .................................................................................................................... 14

3.1 PASSENGER ELECTRIC MULTIPLE UNITS ................................................................................... 14
3.2 LOCOMOTIVES AND ENGINEERING SERVICE VEHICLES ..................................................... 15

CHAPTER-4 ELECTRIC TRACTION .......................................................................................................... 16

4.1 ELECTRIC TRACTION 750 V DC (THIRD RAIL WITH TOP CURRENT COLLECTION) ............. 16
LIST OF APPENDICES

<table>
<thead>
<tr>
<th>No.</th>
<th>Appendix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Appendix-1</td>
<td>Permissible Speed, Cant and Track centres on curves</td>
</tr>
<tr>
<td>2</td>
<td>Appendix-2(TNL/ELE/AG) &amp; 2 (AG)</td>
<td>Extra Horizontal Shift of curves</td>
</tr>
<tr>
<td>3</td>
<td>Appendix-3(TNL),3(ELE/AG) &amp; 3(AG)</td>
<td>Cant Effect on Structure gauge</td>
</tr>
<tr>
<td>4</td>
<td>Appendix-3A(TNL/ELE/AG) &amp; 3A(AG)</td>
<td>Cant Effect on Kinematic envelope</td>
</tr>
<tr>
<td>5</td>
<td>Appendix-4 (TNL)</td>
<td>Shift of Centre of Circular Tunnel due to cant</td>
</tr>
<tr>
<td>6</td>
<td>Appendix-5</td>
<td>Extra Clearance for platforms on curves</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FIGURE-1(TNL/AG/ELE) Kinematic Envelope for Underground, At Grade and Elevated Sections on Tangent Ballastless Track</td>
</tr>
<tr>
<td>2</td>
<td>FIGURE-1(AG) Kinematic Envelope for Surface Sections Ballasted Track on Tangent Track</td>
</tr>
<tr>
<td>3</td>
<td>FIGURE-2(TNL) Structure Gauge for Underground Sections Ballastless Track on Tangent Track and Curved Track with radius 200m outside Stations</td>
</tr>
<tr>
<td>4</td>
<td>FIGURE-2(ELE/AG) Structure Gauge for Elevated and At Grade Sections Ballastless Track on Tangent Track outside Stations</td>
</tr>
<tr>
<td>5</td>
<td>FIGURE-2(AG) Structure Gauge for At Grade Sections Ballasted Track on Tangent Track outside Stations</td>
</tr>
<tr>
<td>6</td>
<td>FIGURE-3 Shift of Centre of Tunnel due to Cant</td>
</tr>
<tr>
<td>7</td>
<td>FIGURE-4 Effect of Cant on Structure Gauge</td>
</tr>
<tr>
<td>8</td>
<td>FIGURE-4A Effect of Cant on Kinematic Envelope</td>
</tr>
<tr>
<td>9</td>
<td>FIGURE-5 Effect of Vertical Curve on structure gauge</td>
</tr>
<tr>
<td>10</td>
<td>FIGURE-6(TNL) Structure Gauge at Underground Station with Side Platforms.</td>
</tr>
<tr>
<td>11</td>
<td>FIGURE-6A(TNL) Structure Gauge at Underground Station with Island Platform</td>
</tr>
<tr>
<td>12</td>
<td>FIGURE -6(ELE) Structure Gauge at Elevated Station</td>
</tr>
<tr>
<td>13</td>
<td>FIGURE-6(AG) Structure Gauge at At-Grade Station (with ballasted track)</td>
</tr>
</tbody>
</table>
KOLKATA METRO EAST WEST LINE PROJECT

SCHEDULE OF DIMENSIONS – 1435 mm GAUGE

PREAMBLE

The Schedule of Dimensions for Standard Gauge Kolkata East West line has been prepared based on the following:-

1. The dimensions given in this Report are to be observed in all new works and alterations to existing works on 1435 mm gauge (Standard Gauge) railway.

2. This Schedule of Dimensions is applicable to Underground, Elevated and Surface (At-Grade) sections with 750 Volt D.C. Traction system and Third Rail for current collection adjacent to the track. The Rolling Stock details are provided in chapter 3 of this Schedule of Dimensions (SOD). The Rolling stock will have sealed windows and doors will be closed while in motion.

3. The Underground system may run within a Circular Tunnel or Rectangular Box or any other suitable shape while Elevated system may run on suitable Over Ground structures such as Viaducts. Both Underground and Elevated systems shall have suitably designed Ballastless (DFF) Track. The At-grade system may have Ballasted Track, or if necessary, Ballastless track.

4. The Kinematic Envelope indicated in the SOD shall not be violated under any circumstances except for designated railway operational structures such as platform edges, platform screen doors, Third rail arrangements.

5. No fixed structure should infringe the Structure Gauge except for designated railway operational structures. Designated railway operational structures include platform edges, platform screen doors, emergency walkways, Third rail arrangements.

The Schedule of Dimensions (SOD) has been divided into four chapters as under

Chapter-1  General
Chapter-2  Station yards
Chapter-3  Rolling Stock
Chapter-4  Electric Traction
CHAPTER-1 GENERAL

1.1 SPACING OF TRACKS

1.1.1 Minimum distance, between centre to centre of tracks on Tangent (Straight) alignment, without any structure located between the tracks, shall be:

a) Underground Sections 3650 mm
b) Elevated Sections 3750 mm
c) Surface (At-Grade) Sections (Ballastless section) 3750 mm
d) Surface (At-Grade) Sections (Ballasted section) 3800 mm

Note: For minimum track centres on curves, refer to Appendix-1

1.2 CURVES

1.2.1 Minimum radius of curves (horizontal)

i) On main running lines
   a) Underground Sections, 200 m (Minimum)
   b) Elevated and At-Grade Sections, 190 m (Minimum)

   Absolute Minimum radius (with check rails) 120 m

ii) Depot and other Lines, 140 m (Minimum)
   (with check rails) 100 m (Minimum)

iii) At passenger Stations, 1000m (Minimum)

1.2.2 Minimum radius of vertical curve, 1500 m

1.3 BUILDINGS AND STRUCTURES

1.3.1 Minimum horizontal distance from centre of track to any structure (except a passenger platform and Conductor Rail (Third Rail) for heights above rail level on tangent track on level/constant grade shall be as under:

a) Underground Sections (Circular Tunnel and Rectangular Box Tunnel)

<table>
<thead>
<tr>
<th>Height from rail level</th>
<th>Distance from C.L. of track</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Up to 75 mm</td>
<td>1670 mm increasing to 1705 mm</td>
</tr>
<tr>
<td>(ii) 75 mm to 920 mm</td>
<td>1705 mm</td>
</tr>
<tr>
<td>(iii) 920 mm to 1765 mm</td>
<td>1705 mm increasing to 1770 mm</td>
</tr>
</tbody>
</table>
(iv) 1765 mm to 3150 mm  1770 mm increasing to  1805 mm
(v) 3150 mm to 3550 mm  1805 mm decreasing to  1450 mm
(vi) 3550 mm to 3975 mm  1450 mm decreasing to  610 mm
(vii) 3975 mm  610 mm decreasing to  zero

Also refer to Figure No.2 (TNL)

b) **Elevated Sections, At Grade (Ballastless Track) Sections**

<table>
<thead>
<tr>
<th>Height from rail level</th>
<th>Distance from C.L. of track</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) From R.L. to 360 mm</td>
<td>1755 mm</td>
</tr>
<tr>
<td>(ii) At 360 mm</td>
<td>1755 mm decreasing to 1650 mm</td>
</tr>
<tr>
<td>(iii) 360 mm to 960 mm</td>
<td>1650 mm increasing to 1760 mm</td>
</tr>
<tr>
<td>(iv) 960 mm to 1760 mm</td>
<td>1760 mm increasing to 1820 mm</td>
</tr>
<tr>
<td>(v) 1760 mm to 3090 mm</td>
<td>1820 mm increasing to 1855 mm</td>
</tr>
<tr>
<td>(vi) 3090 mm to 3555 mm</td>
<td>1855 mm decreasing to 1560 mm</td>
</tr>
<tr>
<td>(vii) 3555 mm to 4025 mm</td>
<td>1560 mm decreasing to 610 mm</td>
</tr>
<tr>
<td>(viii) At 4025 mm</td>
<td>610 mm decreasing to zero</td>
</tr>
</tbody>
</table>

Also refer to Figure No.2 (ELE/AG)

c) **Surface (At-Grade) Sections (Ballasted Track)**

<table>
<thead>
<tr>
<th>Height from rail level</th>
<th>Distance from C.L. of track</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) From R.L to 88 mm</td>
<td>1765 mm</td>
</tr>
<tr>
<td>(ii) From 88 to 3085 mm</td>
<td>1880 mm</td>
</tr>
<tr>
<td>(iii) 3085 mm to 3515 mm</td>
<td>1880 mm decreasing to 1585 mm</td>
</tr>
<tr>
<td>(iv) 3515 mm to 4035 mm</td>
<td>1585 mm decreasing to 505 mm</td>
</tr>
<tr>
<td>(v) At 4035 mm</td>
<td>505 mm decreasing to zero</td>
</tr>
</tbody>
</table>

Also refer to Figure No.2 (AG)

**Notes for (a), (b) and (c) above:**

i) Extra allowance shall be provided for curves as laid down at para 1.6.

ii) The term ‘structure’ covers any item including light ones like ladders, isolated posts, cables etc. erected alongside the track.
1.4 **KINEMATIC ENVELOPE**

For Kinematic Envelope for level or constant grade tangent track, refer to:

a) Figure No. 1(TNL/AG/ ELE) for Underground, At-Grade and Elevated Sections with Ballastless Track.

b) Figure No. 1(AG) for Surface (At-Grade) Sections with Ballasted Track.

1.5 **STRUCTURE GAUGE**

1.5.1 **Underground sections**

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing a minimum clearance of 100 mm to Kinematic Envelope.

Refer to Figure No.2 (TNL) for Structure Gauge for underground sections (Outside station) with Ballastless Track for level constant grade tangent track.

**Note:** Extra allowance shall be provided for curves as laid down at para 1.6

1.5.2 **Elevated Sections and Surface (At-Grade) section with Ballastless track.**

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing a minimum clearance of 150 mm to Kinematic Envelope.

Refer to Figure No.2(ELE/AG) for Structure Gauge on Elevated Sections and At-Grade Sections (outside station) with Ballastless Track for level/constant grade tangent track.

**Note:** Extra allowance shall be provided for curves as laid down at para 1.6

1.5.3 **Surface (At-Grade) Sections (Ballasted Track)**

The Structure Gauge (Fixed Structure Line) has been arrived at by allowing a minimum clearance of 150 mm to Kinematic Envelope.

Refer to Figure No.2 (AG) for Structure Gauge on At-Grade sections (outside stations) with Ballasted Track for level/constant grade tangent track.

**Note:** Extra allowance shall be provided for curves as laid down at para 1.6

1.6 **EXTRA CLEARANCES ON CURVES**

Following are the extra allowances considered for curves.

Abbreviations used in para 1.6:

- \( C \) is the distance between centres of bogies in metres,
- \( C_1 \) is the coach (vehicle) length in metres,
- \( R \) is the radius of curve in metres,
- \( Ca \) is the Cant applied in mm,
- \( h \) is the height from rail level in mm and
g is the distance between centres of rails in mm.

1.6.1 Inside of curve

(A) Curvature effect

i) Mid throw at the center of the vehicle $= V$ (in mm)

$= 125xC^2/R$

ii) Allowance due to gauge widening on curves

For values of curvature effect, refer to:

Appendix-2(TNL/ELE/AG) for Underground, Elevated/At Grade Ballastless Sections

Appendix-2(AG) for surface (At-Grade) Ballasted Sections

Note:

a) Underground, Elevated and At-Grade Ballastless Sections

A lateral shift of 34 mm due to nosing is included in the Kinematic Envelope for Underground, Elevated and At-Grade Sections with Ballastless Track for tangent track (and as a result, also included in Structure Gauge) which shall be subtracted from the total extra allowance worked out as at para 1.6.1(A) above if the value of mid throw $(V)$ is equal to or greater than 34 mm. However, if the value of mid throw $(V)$ is less than 34 mm, the curvature effect shall be due to widening of the gauge only (Mid throw minus 34 mm shall be taken as zero).

b) At-Grade (Surface) Ballasted Sections

A lateral shift of 37 mm due to nosing is included in the Kinematic Envelope for Surface (At-Grade) Sections with Ballasted Track for tangent track (and as a result, also included in Structure Gauge) which shall be subtracted from the total extra allowance worked out as at para 1.6.1(A) above if the value of mid throw $(V)$ is equal to or greater than 37 mm. However, if the value of mid throw $(V)$ is less than 37 mm, the curvature effect shall be due to widening of the gauge only (Mid throw minus 37 mm shall be taken as zero).

(B) Allowance for Cant

a) Underground (Box structures) Elevated and At-Grade (Surface) sections

The lean ‘L’ due to Cant at any point at height ‘h’ above rail level is given by:

$L = Ca \times h/g$ (all in mm)

For values of Structure Gauge $(E_1)$ for inside of a curve with only the cant effect, as shown in Figure 4, refer to:

(i) Appendix -3(TNL) for Box structures of Underground Sections

(ii) Appendix -3(ELE/AG) for Elevated and At Grade Ballastless Sections
b) **Circular Tunnels**

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the centre of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about midpoint of top of inner rail, resulting in shift of Tunnel centre laterally towards inside of curve and also vertically upwards.

For values of horizontal and vertical shifts of centre of Circular Tunnel for different values of cant, refer to Appendix-4 (TNL) and Figure No.-3.

(C) **Vertical Throw (allowance for vertical curve)**

Values of Vertical Throw $V_1$ and $V_2$ (in mm) for vertical curves shall be calculated as under:

$V_1$ (with vehicle centre in sag or vehicle end on summit) = $125 \frac{C_1^2}{R}$

$V_2$ (with vehicle centre on summit or vehicle end in sag) = $\left[ 125 \frac{C_1^2}{R} \right] - \left[ 125 \frac{C_2^2}{R} \right]$

Value of Vertical Throw $V_1$ & $V_2$ due to vertical curves of different radii are shown in Figure 5.

1.6.2 **OUTSIDE OF CURVE**

(A) **Curvature effect**

(i) End throw at the end of vehicle = $V_o$ (in mm)

\[ = \left[ 125 \times C_1^2/R \right] - \left[ 125 \times C_2^2/R \right] \]

(ii) Allowance due to gauge widening on curves

(iii) Additional nosing due to gauge widening on curves

The values of items (i) to (iii) are shown in Appendix-2(TNL/ELE/AG) and 2(AG).

(B) **Allowance for Cant**

a) **Elevated, Surface and box sections of Underground**

The lean ‘L’ due to Cant at any point at height ‘h’ above rail level is given by:

$L = (-) Ca x h/g$ (all in mm)

-ve (negative) sign indicates relief due to cant or reduction in clearance required.

**Note:**
Full relief for lean due to cant (Ca) is to be taken into account only for calculation of track spacing without any structure between tracks. In case there is a structure adjacent to track, relief for lean is to be taken into account only if the cant provided is greater than 50 mm and shall be limited to a value = (Ca - 50) x h/g.

For values of Structure Gauge (F₁) on outside of curve with cant effect only as shown in Figure-4, refer to:

(i)  Appendix 3( TNL) for Underground sections(Rectangular Box)
(ii) Appendix 3(ELE/AG) for Elevated and At-Grade Ballastless sections.
(iii) Appendix 3(AG) for Surface (At-Grade) Ballasted sections

b) Circular Tunnels

In the case of Circular Tunnel, the cant is provided by raising the outer rail and suitably shifting the centre of the Circular Tunnel towards inside of curve and upwards. This has same effect as assuming rotation of the Circular Tunnel about midpoint of top of inner rail resulting in shift of Tunnel centre laterally towards inside of curve and also vertically upwards.

For values of horizontal and vertical shifts of centre of Circular Tunnel for different values of cant, refer to Appendix-4 (TNL) and Figure-3.

(C) Allowance for Vertical Curve (Vertical Throw)

The provision at para 1.6.1 (c) above shall be applicable in this case also. Values of vertical throw V₁ and V₂ due to vertical curves of different radii are shown in Figure 5.

1.7 MINIMUM TRACK SPACING ON CURVES

Underground, Elevated and Surface Sections

The worst case will be when the end of a bogie carriage on the inner track is opposite the centre of a similar carriage on the outer track.

1.7.1 Without any structure between tracks

The minimum track spacing on curves without any structure between tracks shall be the sum of the following:

(i)  (E + F),
(ii)  T₁ (Extra lateral allowance due to curvature on inside of curve)
(iii) T₂ (Extra lateral allowance due to curvature on outside of curve)
(iv) Minimum clearance between adjacent Kinematic Envelopes stipulated as under:

a)  200 mm  for Underground Sections
b) 300 mm for Elevated Sections

c) 300 mm for Surface (At-Grade) Sections and

Where,

E is the distance from vertical axis of centre line of tangent track to canted Kinematic Envelope on inside of curve at a height ‘h’ (from rail level) for a given cant (Figure-4A) and

F is the distance from vertical axis of centre line of tangent track to canted Kinematic Envelope on outside of curve at a height ‘h’ (from rail level) for a given cant (Figure-4A).

Notes:

a) The value of ‘F’, calculated from the formula at Figure 4A includes full relief due to Cant.

b) The sum of ‘E’ and ‘F’ for same height (which are with cant effect only), shall be the maximum of values calculated for various heights from rail level.

1.7.1.1 For values of E, F, T₁ and T₂, refer to the Appendices as shown below:

<table>
<thead>
<tr>
<th>SECTIONS</th>
<th>For E &amp; F</th>
<th>For T₁ &amp; T₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) UG,Elev,At-Grade BLT</td>
<td>3A(TNL/ELE/AG)</td>
<td>2(TNL/ELE/AG)</td>
</tr>
<tr>
<td>(ii) Surface (At-Grade)Ballasted</td>
<td>3A(AG)</td>
<td>2(AG)</td>
</tr>
</tbody>
</table>

1.7.2 With a structure between adjacent tracks

The minimum track spacing on curves with a structure between tracks shall be the sum of the following:

(i) \((E₁ + T₁)\) Minimum clearance to the structure from centre line of track on inside of curve (for outer track)

(ii) \((F₁ + T₂)\) Minimum clearance to the structure from centre line of track on outside of curve (for inner track)

(iii) Width of structure between adjacent tracks (measured across the tracks).

Where,

\(E₁\) is the horizontal distance from vertical axis of centre line of tangent track to canted Structure Gauge on inside of curve for a given cant,

\(F₁\) is the horizontal distance from vertical axis of centre line of tangent track to canted Structure Gauge on outside of curve for a given cant,

\(T₁\) is extra lateral allowance due to curvature on inside of curve and

\(T₂\) is extra lateral allowance due to curvature on outside of curve
Notes:

a) The values of $E_1$ and $F_1$ for a given cant $Ca$, shall each be the maximum of values at different heights of structure from rail level. In case the cant provided is greater than 50 mm on inner track, the value of $F_1$ shall be for the cant of $(Ca-50)$ mm. In case the cant provided is 50 mm or less on inner track, the value of $F_1$ shall be for ZERO cant.

b) Minimum track spacing, so worked out with a structure between the adjacent tracks shall not be less than that calculated as per para 1.7.1 for tracks without any structure between adjacent tracks.

For values of $E_1$, $F_1$, $T_1$ and $T_2$, refer to the Appendices as shown in Table below:

<table>
<thead>
<tr>
<th>SECTIONS</th>
<th>$E_1$ &amp; $F_1$</th>
<th>$T_1$ &amp; $T_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Underground</td>
<td>3(TNL)</td>
<td>2(TNL/ELE/AG)</td>
</tr>
<tr>
<td>(ii) Elevated &amp; At Grade BLT</td>
<td>3(ELE/AG)</td>
<td>2(TNL/ELE/AG)</td>
</tr>
<tr>
<td>(iii) At Grade Ballasted</td>
<td>3(AG)</td>
<td>2(AG)</td>
</tr>
</tbody>
</table>

1.8 SPECIAL OPERATING CONDITIONS (COMMON FOR UNDERGROUND, ELEVATED AND AT GRADE)

1.8.1 Scheduled maintenance of permanent wayside assets such as track, signalling, traction equipment etc shall be performed outside service hour only.

1.8.2 No workman/equipment/structure are allowed between vehicle and structure gauge during operation of trains.

1.8.3 At stations provided with Platform Screen Door the maximum operating speed for any train entering, leaving or passing through the station shall be limited to 50 kmph.

1.9 ADDITIONAL OPERATING CONDITION FOR ELEVATED AND AT GRADE SECTION.

1.9.1 In case of elevated corridor, the track is expected to be on the surface at some locations passing through populated areas and there are chances of people passing through the track. Considering this fact, the track in such lengths shall be robustly fenced.

1.9.2 As the track will be open to climate, temperature variation will take place in the track, which may require patrolling of the section during extreme winter and summer. For this purpose, provision shall be made for visual inspection from the walk way on the outside of each track permitting safe walking for patrolmen during service hours.
CHAPTER-2 STATIONS

2.1 MINIMUM SPACING OF TRACKS AT STATIONS

Minimum Spacing of tracks at station on straight and on curve of radius of 1000 M and flatter, without any structure between adjoining tracks for:

a) Underground Section 3650 mm
b) Elevated Section 3750 mm
c) At-Grade Section (ballastless track) 3750 mm
d) At-Grade Section (ballasted track) 3800 mm

2.2 PLATFORMS

2.2.1 Maximum horizontal distance from centre of track to face of passenger platform coping 1525 mm (A)

2.2.2 Minimum horizontal distance from centre of track to face of passenger platform coping 1515 mm (B)

Notes:

a) Platform faces shall be flared away smoothly from the centre line of the track at either end for a distance of 1500 mm so as to give from centre of track a dimension:
   • 1580 ±5 mm
b) For additional clearance for platforms on curves, refer to para 2.7.

<table>
<thead>
<tr>
<th>2.2.3</th>
<th>Ballastless Track</th>
<th>Ballasted Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Maximum height above rail level for passenger platform 1085 mm</td>
<td>1095 mm</td>
</tr>
<tr>
<td>(b)</td>
<td>Minimum height above rail level for passenger platform 1075 mm</td>
<td>1085 mm</td>
</tr>
</tbody>
</table>

Note:

The height of platform serving superelevated track should be in relation to the plane passing through the top of both the rails.

2.2.4 (i) Minimum horizontal distance of any isolated structure on a passenger platform from the edge of coping 2500 mm
(ii) Minimum horizontal distance of any continuous structure on a passenger platform from the edge of coping 3000 mm

**Note:**
The structure on the platform is treated as isolated if the length along the platform length is 2000 mm or less. Any structure having a length exceeding 2000 mm is treated as continuous structure.

2.2.5 For Structure Gauge at stations, refer to Figures as under:

a) For Underground Stations  
   Figure-6(TNL) & 6A(TNL)

b) For Elevated Stations  
   Figure No.6(ELE)

c) For Surface (At-Grade) Station  
   Figure No.6(AG)

2.3 GRADIENTS

2.3.1 Station Yards

Gradient in station yards, unless special safety devices are adopted and / or special rules enforced to prevent accidents in accordance with approved special instructions, shall be as under:

a) Maximum gradient  
   1 in 1000

b) Desirable Level

**Note:**
There shall be no change of grade / vertical curve within 30 metres of any points or crossings on Ballasted track. In the case of Ballastless track, there shall be no change of grade / vertical curve on the turnout.

2.3.2 Mid Section

Maximum gradient in Mid Section  
1 in 25

The gradient will be compensated for curvature at the rate of 0.04% per degree of curve.

2.4 INTERLOCKING AND SIGNAL GEAR

Maximum height above rail level of any part of interlocking or signal gear on either side of centre of track subject to the restrictions embodied in Note below shall be as under:

a) In Underground Stations
   - From CL of track to 1150 mm  
     25 mm
   - From 1150 mm to 1670 mm  
     25 mm rising to 65 mm

b) In Elevated Stations
- From C.L. of track to 1150 mm 25 mm
- From 1150 mm to 1605 mm 25 mm increasing to 65 mm
- From 1605 mm to 1755 mm 65 mm increasing to 200 mm

c) In Surface Stations
- From C.L. of track to 1160 mm 25 mm
- From 1160 mm to 1615 mm 25 mm increasing to 65 mm
- From 1615 mm to 1880 mm 65 mm increasing to 200 mm

Note:
Except for check rails of ordinary and diamond crossings, or wing rails and point rails of crossings leading to snag dead ends, or such parts of signalling gear as are required to be actuated by the wheels, no gear or track fittings shall project above rail level for a distance of 229 mm outside and 140 mm inside the gauge face of the rails.

2.5 POINTS & CROSSING

2.5.1 Maximum clearance of check rail opposite nose of crossing 44 mm
2.5.2 Minimum clearance of check rail opposite nose of crossings and at heel of switch rail 41 mm
2.5.3 Maximum clearance of wing rail at nose of crossing 44 mm
2.5.4 Minimum clearance of wing rail at nose of crossings. 41 mm
2.5.5 Minimum clearance between toe of open switch and stock rail 115 mm
2.5.6 Minimum radius of curvature for slip points, turnouts of crossover roads.
   a) For passenger running lines 120 metres
   b) For Depot lines and other than passenger running lines 100 metres
2.5.7 Minimum angle of crossing (ordinary) for passenger running lines 1 in 7
2.5.8 Diamond crossings not to be flatter than 1 in 6

Notes:
   a) The above restrictions shall not apply to moveable diamond crossings
   b) There must be no change of super-elevation (of outer over inner rail) between points 18 metres outside toe of switch rail and nose of crossings respectively, except in the case of special crossing leading to snag dead-ends or under circumstances as provided for in item 2.6 below.
2.5.9 Minimum length of tongue rail. 3660 mm

2.6 SUPERELEVATION AND SPEED AT STATIONS ON CURVES WITH TURNOOUTS OF CONTRARY AND SIMILAR FLEXURE.
2.6.1 Main Line:

Subject to the permissible run through speed based on the standard of interlocking, the equilibrium super-elevation, calculated for the speed of the fastest train may be reduced by a maximum amount of 100 mm without reducing speed on the main line.

2.6.2 Turnouts:

i) Curves of contrary flexure

The equilibrium superelevation \( s \) in mm should be \( s = \frac{(1435+c)}{127}) \left( \frac{V^2}{R} \right) \)

Where, \( c \) = Rail head width, \( R \) = radius of turnout in metres and \( V \) is speed on turnout in Kmph. The permissible negative superelevation on the turnout (which is also the actual superelevation of the main line) may then be \( (100 - s) \) mm.

ii) Curves of Similar flexure

The question of reduction or otherwise of superelevation on the main line must necessarily be determined by the administration concerned. In the case of a reverse curve close behind the crossing of a turnout, the superelevation may be run out at the maximum of 1 mm in 440 mm.

2.7 ADDITIONAL CLEARANCE FOR PLATFORMS ON CURVES

The additional clearance for platforms on curves is to be provided as under:

2.7.1 On inside of curve: Mid throw

2.7.2 On outside of curve: End throw

The additional clearance for platforms on curves is shown at Appendix-5

Note:

1. As the minimum radius of Curve for stations is 1000 m, there will be no gauge widening at stations.

2. No superelevation will be provided in passenger platform lines.
CHAPTER-3 ROLLING STOCK

3.1 PASSENGER ELECTRIC MULTIPLE UNITS.

1) Coach width 2880 mm

2) Length of the coach body (maximum) 20800* mm
   (*The length of the Driving Motor Car may be increased up to 21050 mm, without exceeding the Kinematic Envelope given in this Schedule of Dimensions)

3) Distance between bogie centres 14700 + 250 mm

4) Kinematic Envelope for level tangent track
   (i) For Underground and Elevated Sections Figure No. 1(TNL/AG/ELE)
   (ii) For Surface (At-Grade) Sections Figure No. 1(AG)

5) Minimum clearance above Rail level under dynamic condition of fully loaded vehicle under worst condition * for bogie mounted equipment 65 mm

6) Minimum clearance above Rail level under dynamic condition of fully loaded vehicle under worst condition * for body mounted equipment 102 mm

* The "worst condition" means that it is with the deflection of primary springs with maximum tread wear.

7) Wheel
   (a) Maximum wheel gauge back to back distance 1360 mm
   (b) Minimum wheel gauge back to back distance 1358 mm

8) a) Maximum diameter on the tread measured at 70 mm from the wheel gauge face 860 mm
   b) Minimum diameter on the tread measured at 70 mm from the wheel gauge face 780 mm

9) a) Minimum projection for flange of new wheel measured from tread at 70 mm from the wheel gauge face 28 mm
b) Minimum projection for flange of worn wheel measured from tread at 70 mm from the wheel gauge face 36 mm

10) a) Maximum thickness of flange of wheel measured from wheel gauge face at 18 mm from outer edge of flange. 32.5 mm
b) Minimum thickness of flange of wheel measured from wheel gauge face at 18 mm from outer edge of flange. 22 mm

11) Minimum width of wheel 135 ±1 mm

12) Incline of tread 1 in 20

13) Floor Height

(a) Maximum height above rail level for floor of any unloaded vehicle 1130 mm
(b) Minimum height above rail level for floor of any loaded vehicle under operating conditions 1100 mm

14) a) Maximum height of centre couplers above rail level for unloaded vehicle 815 mm
b) Minimum height of centre couplers above rail level for unloaded vehicle 740 mm

15) Length over buffers/couplers 21900 mm

16) Adjacent axles (maximum) 12750 mm

17) Length of rigid wheel base for single bogie 2200 to 2400 mm

3.2 LOCOMOTIVES AND ENGINEERING SERVICE VEHICLES

Other items of rolling stock, viz. shunting locomotives and inspection cars, emergency re-railing van, track machines, etc., used on Kolkata Metro System, will conform with the Kinematic Envelope of the Passenger Electric Multiple Units as shown in Figure-1(TNL/AG/ELE) for Underground, Elevated and At-Grade ballastless sections and Figure-1(AG) for Surface (At-Grade) ballasted Sections.
CHAPTER-4 ELECTRIC TRACTION

4.1 ELECTRIC TRACTION 750 V DC (THIRD RAIL WITH TOP CURRENT COLLECTION)

4.1.1 (a) Maximum height from top of rail level to current collecting surface of the conductor rail 164 mm
(b) Minimum height from top of rail level to current collecting surface of the conductor rail 148 mm

4.1.2 (a) Maximum distance of centre line of the conductor rail from the track centre 1380 mm
(b) Minimum distance of centre line of the conductor rail from the track centre 1360 mm

4.1.3 Minimum distance between the bottom of the shroud and the top of the conductor rail 100 mm

4.1.4 Minimum distance between the centre line of the conductor rail and the shroud structure 110 mm

4.1.5 (a) Minimum clearance between live parts of third rail / and structure in static and dynamic conditions as per IEC 60913 25 mm
(b) Minimum clearance between live parts of third rail / vehicle and vehicle body as per IEC 60913 25 mm

Note: Dimension in § 4.1.1, 4.1.3, 4.1.4 could be adjusted to some extent during the design stage between PS and RS contractor.
PERMISSIBLE SPEED, CANT AND MINIMUM TRACK SPACING ON CURVES.
UNDER GROUND (TUNNELS), ELEVATED AND SURFACE (AT-GRADE) SECTIONS

(REFERENCE: PARA 1.1)

<table>
<thead>
<tr>
<th>RADIUS OF CURVE</th>
<th>CANT</th>
<th>MAXIMUM PERMISSIBLE SPEED</th>
<th>MINIMUM DISTANCE BETWEEN ADJACENT TRACKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>UNDER GROUND</td>
</tr>
<tr>
<td>metres</td>
<td>mm</td>
<td>kmph</td>
<td>mm</td>
</tr>
<tr>
<td>3000</td>
<td>15</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>2800</td>
<td>15</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>2400</td>
<td>20</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>2000</td>
<td>20</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>1600</td>
<td>25</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>1500</td>
<td>30</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>1200</td>
<td>35</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>1000</td>
<td>40</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>800</td>
<td>55</td>
<td>80</td>
<td>3650</td>
</tr>
<tr>
<td>600</td>
<td>70</td>
<td>80</td>
<td>3700</td>
</tr>
<tr>
<td>500</td>
<td>85</td>
<td>80</td>
<td>3700</td>
</tr>
<tr>
<td>450</td>
<td>95</td>
<td>80</td>
<td>3750</td>
</tr>
<tr>
<td>400</td>
<td>105</td>
<td>80</td>
<td>3750</td>
</tr>
<tr>
<td>350</td>
<td>125</td>
<td>80</td>
<td>3800</td>
</tr>
<tr>
<td>300</td>
<td>125</td>
<td>75</td>
<td>3800</td>
</tr>
<tr>
<td>200</td>
<td>125</td>
<td>60</td>
<td>3900</td>
</tr>
<tr>
<td>175</td>
<td>125</td>
<td>55</td>
<td>NA</td>
</tr>
<tr>
<td>150</td>
<td>125</td>
<td>50</td>
<td>NA</td>
</tr>
<tr>
<td>120</td>
<td>125</td>
<td>45</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes:
(a) The track spacing shown in the table above is without any column/structure between two tracks and is with equal cant for both outer and inner tracks.
(b) Track spacing shown in Table above is not applicable to stations which should be calculated depending on specific requirement.
(c) Figures for any intermediate radius of curvature may be obtained by interpolating between two adjacent radii. For higher radii, values may be extrapolated.
**APPENDIX-2(TNL/ELE/AG)**

**HORIZONTAL SHIFT ON CURVES - (CURVATURE EFFECT)**

**TUNNEL/ELEVATED/AT GRADE BALLASTLESS SECTIONS INSIDE OF CURVE**

REFERENCE: PARA 1.6

<table>
<thead>
<tr>
<th>RADIUS (METERS)</th>
<th>MID-THROW (27940/R) (V)</th>
<th>NOSING INCLUDED IN K.E./STRUCTURE GAUGE FOR TANGENT TRACK (mm)</th>
<th>EXTRA GAUGE TOLERANCE ON CURVES (G)</th>
<th>EXTRA HORIZONTAL SHIFT ON CURVE (mm) (T1)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>232.8</td>
<td>34.0</td>
<td>9.0</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>186.3</td>
<td>34.0</td>
<td>9.0</td>
<td>161</td>
<td>GAUGE WIDENING ON CURVES = 9 mm FOR CURVES SHARPER THAN 500 M RADIUS AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>175</td>
<td>159.7</td>
<td>34.0</td>
<td>9.0</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>139.7</td>
<td>34.0</td>
<td>9.0</td>
<td>115</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>111.8</td>
<td>34.0</td>
<td>9.0</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>93.1</td>
<td>34.0</td>
<td>9.0</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>79.8</td>
<td>34.0</td>
<td>9.0</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>69.9</td>
<td>34.0</td>
<td>9.0</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>62.1</td>
<td>34.0</td>
<td>9.0</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>55.9</td>
<td>34.0</td>
<td>3.0</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>46.6</td>
<td>34.0</td>
<td>3.0</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>39.9</td>
<td>34.0</td>
<td>3.0</td>
<td>9</td>
<td>T1=V-N+G for V EQUAL TO OR GREATER THAN (N) AND T1= G for V &lt; (N)</td>
</tr>
<tr>
<td>800</td>
<td>34.9</td>
<td>34.0</td>
<td>3.0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>31.0</td>
<td>34.0</td>
<td>3.0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>27.9</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>23.3</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>18.6</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>17.5</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>14.0</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>11.6</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>2800</td>
<td>10.0</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>9.3</td>
<td>34.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

Mid throw (in mm) \( V = \frac{(125 \times C^2)}{R} = \frac{27940}{R} \)

Where 'C' is the distance between bogie centers = 14.700+0.250=14.950m OR 14.700 - 0.250=14.450 m.

The worst case will be with C=14.950 m

R is the radius of curve in metres.

Mid throw (in mm) \( V = \frac{(125 \times C^2)}{R} = \frac{27940}{R} \)
### OUTSIDE OF CURVE

<table>
<thead>
<tr>
<th>RADIUS (METERS) R</th>
<th>END-THROW (30610/R) (mm)</th>
<th>EXTRA GAUGE TOLERANCE ON CURVES (G)</th>
<th>EXTRA NOSING DUE TO EXTRA GAUGE TOLERANCE (mm) (EN)=Gx0.219723183</th>
<th>EXTRA HORIZONTAL SHIFT ON CURVE (mm) T2=Vo+G+EN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>255.1</td>
<td>9.0</td>
<td>2.0</td>
<td>266</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>204.1</td>
<td>9.0</td>
<td>2.0</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>174.9</td>
<td>9.0</td>
<td>2.0</td>
<td>186</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>153.1</td>
<td>9.0</td>
<td>2.0</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>122.4</td>
<td>9.0</td>
<td>2.0</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>102.0</td>
<td>9.0</td>
<td>2.0</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>87.5</td>
<td>9.0</td>
<td>2.0</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>76.5</td>
<td>9.0</td>
<td>2.0</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>68.0</td>
<td>9.0</td>
<td>2.0</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>61.2</td>
<td>3.0</td>
<td>0.7</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>51.0</td>
<td>3.0</td>
<td>0.7</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>700</td>
<td>43.7</td>
<td>3.0</td>
<td>0.7</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>38.3</td>
<td>3.0</td>
<td>0.7</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>34.0</td>
<td>3.0</td>
<td>0.7</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>30.6</td>
<td>0.0</td>
<td>0.7</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>25.5</td>
<td>0.0</td>
<td>0.7</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>20.4</td>
<td>0.0</td>
<td>0.7</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>19.1</td>
<td>0.0</td>
<td>0.7</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>15.3</td>
<td>0.0</td>
<td>0.7</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>12.8</td>
<td>0.0</td>
<td>0.7</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>2800</td>
<td>10.9</td>
<td>0.0</td>
<td>0.7</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>10.2</td>
<td>0.0</td>
<td>0.7</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

End Throw (in mm) \( V_0 = \frac{(125 \times C_1)}{R} \) - \( \frac{(125 \times C_2)}{R} = 30610/R \)

Where ‘C’ is the distance between bogie centers = 14.700+0.250=14.950m OR 14.700-0.250=14.450m.

Worst case will be with \( C = 14.450 \)

\( C_1 \) is length of coach in meters = 21.30 m and ‘R’ is radius of curve in meters.

### COACH LENGTH=
- FOR DMC IT CAN INCREASE TO 20800
- DIFFERENCE IN LENGTH 21050
- HALF LENGTH FROM CENTRE OF 2 BOGIES 10650
- LENGTH FOR CALCULATIONS OF END THROW 21300

**THIS INCREASE WILL BE ON ONE SIDE FOR DRIVING CAB**

**Page 19**
### APPENDIX-2(AG)

**HORIZONTAL SHIFT ON CURVES - (CURVATURE EFFECT) - SURFACE (AT-GRADE) BALLASTED SECTIONS INSIDE OF CURVE**

**REFERENCE PARA 1.6**

<table>
<thead>
<tr>
<th>RADIUS (METERS) R</th>
<th>MID-THROW (27940/R) (mm) (V)</th>
<th>NOSING INCLUDED IN K.E/STRUCTURE GAUGE FOR TANGENT TRACK (mm) (N)</th>
<th>EXTRA GAUGE TOLERANCE ON CURVES (mm) (G)</th>
<th>EXTRA HORIZONTAL SHIFT ON CURVE (mm) (T1)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>232.8</td>
<td>37</td>
<td>9.0</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>186.3</td>
<td>37</td>
<td>9.0</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>159.7</td>
<td>37</td>
<td>9.0</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>139.7</td>
<td>37</td>
<td>9.0</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>111.8</td>
<td>37</td>
<td>9.0</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>93.1</td>
<td>37</td>
<td>9.0</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>79.8</td>
<td>37</td>
<td>9.0</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>69.9</td>
<td>37</td>
<td>9.0</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>62.1</td>
<td>37</td>
<td>9.0</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>55.9</td>
<td>37</td>
<td>3.0</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>46.6</td>
<td>37</td>
<td>3.0</td>
<td>6</td>
<td>T1= N-G</td>
</tr>
<tr>
<td>700</td>
<td>39.9</td>
<td>37</td>
<td>3.0</td>
<td>1</td>
<td>T1= G</td>
</tr>
<tr>
<td>800</td>
<td>34.9</td>
<td>37</td>
<td>3.0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>31.0</td>
<td>37</td>
<td>3.0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>27.9</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>23.3</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>18.6</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>17.5</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>14.0</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>11.6</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2800</td>
<td>10.0</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>9.3</td>
<td>37</td>
<td>0.0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Mid throw (in mm) \( V = \frac{(125 \times C^2)}{R} = 27940/R \)

Where ‘C’ is the distance between bogie centers = 14.700+0.250=14.950m OR 14.700 - 0.250=14.450 m.

The worst case will be with C=14.950 mm

R is the radius of curve in metres.

Mid throw (in mm) \( V = \frac{(125 \times C^2)}{R} = 27940/R \)
## OUTSIDE OF CURVE

<table>
<thead>
<tr>
<th>RADIUS (METERS) R</th>
<th>END-THROW (30610/R) (mm) (V0)</th>
<th>EXTRA GAUGE TOLERANCE ON CURVES (mm) (G)</th>
<th>EXTRA NOSING DUE TO EXTRA GAUGE TOLERANCE (mm) (EN)=G x 0.219723183</th>
<th>EXTRA HORIZONTAL SHIFT ON CURVE (mm) T2=V0+G+EN</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>255.1</td>
<td>9.0</td>
<td>2.0</td>
<td>266</td>
<td>GAUGE WIDENING ON CURVES = 9 mm FOR CURVES</td>
</tr>
<tr>
<td>150</td>
<td>204.1</td>
<td>9.0</td>
<td>2.0</td>
<td>215</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>175</td>
<td>174.9</td>
<td>9.0</td>
<td>2.0</td>
<td>186</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>200</td>
<td>153.1</td>
<td>9.0</td>
<td>2.0</td>
<td>164</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>250</td>
<td>122.4</td>
<td>9.0</td>
<td>2.0</td>
<td>133</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>300</td>
<td>102.0</td>
<td>9.0</td>
<td>2.0</td>
<td>113</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>350</td>
<td>87.5</td>
<td>9.0</td>
<td>2.0</td>
<td>98</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>400</td>
<td>76.5</td>
<td>9.0</td>
<td>2.0</td>
<td>88</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>450</td>
<td>68.0</td>
<td>9.0</td>
<td>2.0</td>
<td>79</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>500</td>
<td>61.2</td>
<td>3.0</td>
<td>0.7</td>
<td>65</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>600</td>
<td>51.0</td>
<td>3.0</td>
<td>0.7</td>
<td>55</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>700</td>
<td>43.7</td>
<td>3.0</td>
<td>0.7</td>
<td>47</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>800</td>
<td>38.3</td>
<td>3.0</td>
<td>0.7</td>
<td>42</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>900</td>
<td>34.0</td>
<td>3.0</td>
<td>0.7</td>
<td>38</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>1000</td>
<td>30.6</td>
<td>0.0</td>
<td>0.7</td>
<td>31</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>1200</td>
<td>25.5</td>
<td>0.0</td>
<td>0.7</td>
<td>26</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>1500</td>
<td>20.4</td>
<td>0.0</td>
<td>0.7</td>
<td>21</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>1600</td>
<td>19.1</td>
<td>0.0</td>
<td>0.7</td>
<td>20</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>2000</td>
<td>15.3</td>
<td>0.0</td>
<td>0.7</td>
<td>16</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
<tr>
<td>2400</td>
<td>12.8</td>
<td>0.0</td>
<td>0.7</td>
<td>13</td>
<td>SHARPER THAN 500 M RADIUS</td>
</tr>
<tr>
<td>2800</td>
<td>10.9</td>
<td>0.0</td>
<td>0.7</td>
<td>12</td>
<td>AND 3mm FOR CURVES WITH RADIUS OF 500 M TO LESS THAN 1000 M</td>
</tr>
<tr>
<td>3000</td>
<td>10.2</td>
<td>0.0</td>
<td>0.7</td>
<td>11</td>
<td>GAUGE WIDENING ON CURVES=9 mm FOR CURVES</td>
</tr>
</tbody>
</table>

End Throw (in mm) $V_0 = \frac{(125 \times C_1^2)}{R} - \frac{(125 \times C^2)}{R} = 30610/R$

Where 'C' is the distance between bogie centers = 14.700+0.250=14.950m OR 14.700-0.250=14.450m.

Worst case will be with C=14.450

'C1' is length of coach in meters = 21.30 m and 'R' is radius of curve in meters.

### COACH LENGTH=
20800

FOR DMC IT CAN INCREASE TO
21050

DIFFERENCE IN LENGTH
250

THIS INCREASE WILL BE ON ONE SIDE FOR DRIVING CAB

HALF LENGTH FROM CENTRE OF 2 BOGIES
10650

LENGTH FOR CALCULATIONS OF END THROW
21300

---
## APPENDIX-3 (TNL)

### CANT EFFECT ON STRUCTURE GAUGE-HORIZONTAL

**UNDER GROUND SECTIONS (RECTANGULAR BOX TUNNELS)**

<table>
<thead>
<tr>
<th>Height above rail level measured</th>
<th>Distance from center line of track to Structure Gauge for tangent track</th>
<th>D</th>
<th>cos D</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>0.083 0.997 0.03434</td>
<td>1664 1664 201 76</td>
<td>1705 1693 279 4</td>
</tr>
<tr>
<td>120</td>
<td>0.090 0.998 0.03699</td>
<td>1665 1665 193 73</td>
<td>1706 1694 271 1</td>
</tr>
<tr>
<td>115</td>
<td>0.078 0.997 0.03764</td>
<td>1665 1665 189 70</td>
<td>1706 1694 263 2</td>
</tr>
<tr>
<td>110</td>
<td>0.074 0.997 0.03729</td>
<td>1666 1666 177 67</td>
<td>1706 1695 254 5</td>
</tr>
<tr>
<td>105</td>
<td>0.070 0.998 0.03694</td>
<td>1666 1666 169 64</td>
<td>1706 1695 246 8</td>
</tr>
<tr>
<td>100</td>
<td>0.066 0.999 0.03669</td>
<td>1666 1666 161 61</td>
<td>1706 1696 238 12</td>
</tr>
<tr>
<td>95</td>
<td>0.063 0.998 0.03635</td>
<td>1667 1667 153 58</td>
<td>1706 1697 230 15</td>
</tr>
<tr>
<td>90</td>
<td>0.060 0.999 0.03601</td>
<td>1667 1667 145 55</td>
<td>1706 1697 222 18</td>
</tr>
<tr>
<td>85</td>
<td>0.056 0.999 0.05657</td>
<td>1667 1667 137 52</td>
<td>1707 1698 214 21</td>
</tr>
<tr>
<td>80</td>
<td>0.053 0.999 0.05333</td>
<td>1668 1668 129 49</td>
<td>1707 1699 206 24</td>
</tr>
<tr>
<td>75</td>
<td>0.050 0.999 0.04990</td>
<td>1668 1668 121 46</td>
<td>1707 1699 197 27</td>
</tr>
<tr>
<td>70</td>
<td>0.047 0.999 0.04656</td>
<td>1668 1668 113 43</td>
<td>1707 1700 189 31</td>
</tr>
<tr>
<td>65</td>
<td>0.043 0.999 0.04323</td>
<td>1668 1668 105 40</td>
<td>1707 1700 181 34</td>
</tr>
<tr>
<td>60</td>
<td>0.040 0.999 0.03999</td>
<td>1669 1669 97 37</td>
<td>1707 1701 173 37</td>
</tr>
<tr>
<td>55</td>
<td>0.037 0.999 0.03667</td>
<td>1669 1669 90 34</td>
<td>1707 1701 165 40</td>
</tr>
<tr>
<td>50</td>
<td>0.033 0.999 0.03324</td>
<td>1669 1669 80 30</td>
<td>1707 1702 157 43</td>
</tr>
<tr>
<td>45</td>
<td>0.030 0.999 0.02991</td>
<td>1669 1669 72 27</td>
<td>1707 1702 148 46</td>
</tr>
<tr>
<td>40</td>
<td>0.027 0.999 0.02669</td>
<td>1669 1669 64 24</td>
<td>1707 1702 140 50</td>
</tr>
<tr>
<td>35</td>
<td>0.024 0.999 0.02345</td>
<td>1670 1670 56 21</td>
<td>1707 1702 132 54</td>
</tr>
<tr>
<td>30</td>
<td>0.021 0.999 0.01914</td>
<td>1670 1670 48 18</td>
<td>1707 1703 124 58</td>
</tr>
<tr>
<td>25</td>
<td>0.017 0.999 0.01661</td>
<td>1670 1670 40 15</td>
<td>1707 1704 116 59</td>
</tr>
<tr>
<td>20</td>
<td>0.013 0.999 0.01329</td>
<td>1670 1670 32 12</td>
<td>1707 1704 108 62</td>
</tr>
<tr>
<td>15</td>
<td>0.009 0.999 0.00997</td>
<td>1670 1670 24 9</td>
<td>1707 1704 99 66</td>
</tr>
<tr>
<td>10</td>
<td>0.006 0.999 0.00664</td>
<td>1670 1670 16 6</td>
<td>1705 1705 91 16</td>
</tr>
<tr>
<td>5</td>
<td>0.003 0.999 0.00332</td>
<td>1670 1670 8 3</td>
<td>1705 1705 83 7</td>
</tr>
<tr>
<td>0</td>
<td>0.000 0.999 0.00000</td>
<td>1670 1670 0 0</td>
<td>1705 1705 75 75</td>
</tr>
</tbody>
</table>

**Refer to Figure 4**

E1=ab+(h x tan α) x cos α

F1=ab x (h x tan α) x cos α

H1=(Ca/2) x h x cos α+(ab-h x tan α) x sin α

H2=(Ca+2) x (h x cos α)+(ab-h x tan α) x sin α

ab=Distance from center line of vehicle to Structure gauge for tangent track at height 'h' from rail level

d=Distance from center line of Tangent track to Structure Gauge for Canted track at height 'h' from rail level.

bc=tan α-Lateral increment due to cant (measured along the line parallel to line joining top of rails).
## CANT EFFECT ON Structure Gauge-HORIZONTAL ELEVATED AND AT GRADE SECTIONS (BALLASTLESS)

<table>
<thead>
<tr>
<th>Height above rail level measured perpendicular to plane of track</th>
<th>Distances from center lines of vehicles to Structure gauge for Tangent track at height h' from rail level</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1=ab+(h x tan a) x cos a</td>
<td>F1=(ab-h x tan a) x cos a</td>
</tr>
<tr>
<td>H1=(Ca/2)+(h/cos a)-(ab+h x tan a) x sin a</td>
<td></td>
</tr>
</tbody>
</table>

### APPENDIX-3 (ELE/AG)

**Page 23**
<table>
<thead>
<tr>
<th>Height above rail level measured</th>
<th>Distance from center line of track to Structure Gauge for</th>
<th>all figures are in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at-grade sections (ballasted track)</td>
<td></td>
</tr>
</tbody>
</table>

# APPENDIX-3(AG)

**CANT EFFECT ON STRUCTURE GAUGE-HORIZONTAL**

<table>
<thead>
<tr>
<th>Hc</th>
<th>Angle α (Degrees)</th>
<th>Sin α</th>
<th>Angle α (RADIANS)</th>
<th>Cos α</th>
<th>tan α</th>
<th>E₁</th>
<th>F₁</th>
<th>H₁</th>
<th>E₂</th>
<th>F₂</th>
<th>H₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>27</td>
<td>4.721</td>
<td>0.083</td>
<td>0.083</td>
<td>0.083</td>
<td>0.083</td>
<td>1765</td>
<td>1765</td>
<td>959</td>
<td>959</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>72</td>
<td>9.443</td>
<td>0.166</td>
<td>0.166</td>
<td>0.166</td>
<td>0.166</td>
<td>1765</td>
<td>1765</td>
<td>1918</td>
<td>1918</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>117</td>
<td>14.165</td>
<td>0.249</td>
<td>0.249</td>
<td>0.249</td>
<td>0.249</td>
<td>1765</td>
<td>1765</td>
<td>2087</td>
<td>2087</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>162</td>
<td>18.887</td>
<td>0.332</td>
<td>0.332</td>
<td>0.332</td>
<td>0.332</td>
<td>1765</td>
<td>1765</td>
<td>2256</td>
<td>2256</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>207</td>
<td>23.609</td>
<td>0.415</td>
<td>0.415</td>
<td>0.415</td>
<td>0.415</td>
<td>1765</td>
<td>1765</td>
<td>2425</td>
<td>2425</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>252</td>
<td>28.331</td>
<td>0.498</td>
<td>0.498</td>
<td>0.498</td>
<td>0.498</td>
<td>1765</td>
<td>1765</td>
<td>2594</td>
<td>2594</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>307</td>
<td>33.053</td>
<td>0.581</td>
<td>0.581</td>
<td>0.581</td>
<td>0.581</td>
<td>1765</td>
<td>1765</td>
<td>2763</td>
<td>2763</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>362</td>
<td>37.775</td>
<td>0.664</td>
<td>0.664</td>
<td>0.664</td>
<td>0.664</td>
<td>1765</td>
<td>1765</td>
<td>2932</td>
<td>2932</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>417</td>
<td>42.497</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>1765</td>
<td>1765</td>
<td>3101</td>
<td>3101</td>
<td>1765</td>
<td>1765</td>
</tr>
<tr>
<td>472</td>
<td>47.219</td>
<td>0.830</td>
<td>0.830</td>
<td>0.830</td>
<td>0.830</td>
<td>1765</td>
<td>1765</td>
<td>3270</td>
<td>3270</td>
<td>1765</td>
<td>1765</td>
</tr>
</tbody>
</table>

## REFERENCES

- **E₁ = (ab + h x tan α) x cos α**
- **F₁ = (h x tan α) x cos α**
- **H₁ = (Ca/2) x sin α**
- **H₂ = (Ca/2) x sin α**

**ab**—Distance from center line of vehicle to Structure gauge for Tangent track at height 'h' from rail level

**a**—Distance from center line of Tansent track to Structure Gauge for Canted track at height 'h' from rail level

**b**—Lateral increment due to cant (measured along the line parallel to line joining top of rails).
<table>
<thead>
<tr>
<th>Height above rail level measured perpendicular to plane of track</th>
<th>Ht= 996</th>
<th>Ht= 1769</th>
<th>Ht= 3051</th>
<th>Ht= 3266</th>
<th>Ht= 3430</th>
<th>Ht= 3486</th>
<th>Ht= 3681</th>
<th>Ht= 3873</th>
</tr>
</thead>
<tbody>
<tr>
<td>ab= 1610</td>
<td>ab= 1667</td>
<td>ab= 1701</td>
<td>ab= 1565</td>
<td>ab= 1351</td>
<td>ab= 1351</td>
<td>ab= 965</td>
<td>ab= 574</td>
<td></td>
</tr>
</tbody>
</table>

**Distance from center line of track to K.E for tangent track:**

- **Cant Angle:**
- **Sin a**
- **Angle a (RADIANS)**

**Ab=Distance from center line of vehicle to K.E for Tangent track at height h from rail level**

**bc=hxtan a**

**ac=Distance from center line of Tangent track to K.E for Canted track at height 'h' from rail level**

**ab=**

**H1=(Ca/2)+(h/cos a)**

**F=**

**E=**

**REFER TO FIGURE-4A**

- **E=**
- **F=**
- **H1=**
- **H2=**

**APPENDIX- 3A(TNL/ELE/AG)**

**Page 25**
### CANT EFFECT ON KINEMATIC ENVELOPE-HORIZONTAL SURFACE (AT-GRADE) SECTIONS- BALLASTED TRACK

#### APPENDIX-3A(AG)

**Cant Effect**

- **Height above rail level measured perpendicular to plane of track**
- **Distance from center line of track to K.E for tangent track.**

<table>
<thead>
<tr>
<th>Height above rail level measured</th>
<th>ab: 1625</th>
<th>ab: 1686</th>
<th>ab: 1730</th>
<th>ab: 1591</th>
<th>ab: 1530</th>
<th>ab: 1380</th>
</tr>
</thead>
<tbody>
<tr>
<td>sin a</td>
<td>E</td>
<td>F</td>
<td>H1</td>
<td>H2</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>cos a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tan a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>0.083</td>
<td>0.063</td>
<td>0.075</td>
<td>0.063</td>
<td>0.075</td>
<td>0.063</td>
</tr>
<tr>
<td>130</td>
<td>0.080</td>
<td>0.075</td>
<td>0.077</td>
<td>0.075</td>
<td>0.077</td>
<td>0.075</td>
</tr>
<tr>
<td>135</td>
<td>0.077</td>
<td>0.070</td>
<td>0.073</td>
<td>0.070</td>
<td>0.073</td>
<td>0.070</td>
</tr>
<tr>
<td>140</td>
<td>0.070</td>
<td>0.066</td>
<td>0.066</td>
<td>0.066</td>
<td>0.066</td>
<td>0.066</td>
</tr>
<tr>
<td>145</td>
<td>0.066</td>
<td>0.062</td>
<td>0.058</td>
<td>0.058</td>
<td>0.058</td>
<td>0.058</td>
</tr>
<tr>
<td>150</td>
<td>0.058</td>
<td>0.050</td>
<td>0.046</td>
<td>0.046</td>
<td>0.046</td>
<td>0.046</td>
</tr>
<tr>
<td>155</td>
<td>0.046</td>
<td>0.037</td>
<td>0.030</td>
<td>0.030</td>
<td>0.030</td>
<td>0.030</td>
</tr>
<tr>
<td>160</td>
<td>0.030</td>
<td>0.020</td>
<td>0.013</td>
<td>0.013</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>165</td>
<td>0.013</td>
<td>0.007</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>170</td>
<td>0.003</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**Refer to Figure-4A**

- E = \((ab \times \tan \alpha) \times \cos \alpha\)
- F = \((ab \times \tan \alpha) \times \sin \alpha\)
- H1 = \((Ca/2+\tan \alpha) \times \cos \alpha\)
- H2 = \((Ca/2+\tan \alpha) \times \sin \alpha\)

**NOTE:**
- ab = Distance from center line of vehicle to K.E for Tangent track at height 'h' from rail level
- bc = Distance from center line of Tangent tack to K.E for Canted track at height 'h' from rail level.
- \(\alpha = \)Lateral increment due to cant(measured along the line parallel to line joining top of rails.)
### APPENDIX-4 (TNL)

**LATERAL AND VERTICAL SHIFT OF CENTRE OF CIRCULAR TUNNEL**
**FOR DIFFERENT CANT VALUES (WITH D1=760 mm)**
**REFER TO FIGURE-3 AND PARAs 1.6.1 (B)-b AND 1.6.2 (B)-b**

All figures are in mm

<table>
<thead>
<tr>
<th>CANT (mm)</th>
<th>Angle ( \alpha ) in degrees</th>
<th>Lateral shift of tunnel centre=( X )</th>
<th>Vertical shift of tunnel centre=( Y )</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>4.764</td>
<td>155</td>
<td>56</td>
<td>(a) THE CANT IS PROVIDED BY ROTATING THE TUNNEL ABOUT THE MID POINT OF TOP OF INNER RAIL THIS WILL RESULT IN LATERAL AND VERTICAL SHIFT OF THE CENTRE OF THE CIRCULAR TUNNEL.</td>
</tr>
<tr>
<td>120</td>
<td>4.573</td>
<td>149</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>4.382</td>
<td>143</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>4.191</td>
<td>136</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>4.001</td>
<td>130</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>3.81</td>
<td>124</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>3.619</td>
<td>118</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>3.428</td>
<td>111</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>3.238</td>
<td>105</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>3.047</td>
<td>99</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>2.856</td>
<td>93</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>2.666</td>
<td>86</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>2.475</td>
<td>80</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>2.285</td>
<td>74</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>2.094</td>
<td>68</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>1.904</td>
<td>62</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>1.713</td>
<td>55</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>1.523</td>
<td>49</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>1.333</td>
<td>43</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1.142</td>
<td>37</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0.952</td>
<td>31</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0.761</td>
<td>25</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0.571</td>
<td>18</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.381</td>
<td>12</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.19</td>
<td>6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

\( \alpha \) = angle of rotation=\( \sin^{-1} \) (Cant/g) and

\( \theta \) = angle subtended by line joining top of two rails and the line joining mid point of top of inner rail and the centre of circular Tunnel

\[ X = \left(2 \times \frac{r-D1}{\sin \theta} \times \sin \alpha/2 \right) \times \cos (90- \theta - \alpha/2) \]

\[ Y = \left(2 \times \frac{r-D1}{\sin \theta} \times \sin \alpha/2 \right) \times \sin (90- \theta - \alpha/2) \]

Where \( r \) is internal radius of the circular tunnel=2600 mm

\( D1 = \) depth from rail level to invert of circular tunnel=760 mm

\( \theta = \) angle subtended by line joining top of two rails and the line joining mid point of top of inner rail and the centre of circular Tunnel

\[ \theta = \tan^{-1}\left(\frac{r-D1}{g/2}\right) \text{ in degrees}= 67.75703907 \]

\( g = \) Centre to centre of rails = 1505 mm
APPENDIX-5
UNDER GROUND, ELEVATED AND SURFACE STATIONS
ADDITIONAL CLEARANCE FOR PLATFORMS ON CURVES
REFERENCE: PARA 2.7

<table>
<thead>
<tr>
<th>RADIUS (meters)</th>
<th>CANT Ca (mm)</th>
<th>EXTRA ALLOWANCE (mm)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>INSIDE OF CURVE</td>
<td>OUTSIDE OF CURVE</td>
</tr>
<tr>
<td>3000</td>
<td>0</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>2400</td>
<td>0</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>1800</td>
<td>0</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>1600</td>
<td>0</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>1500</td>
<td>0</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>1200</td>
<td>0</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>1000</td>
<td>0</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOTES:
1. ALL DIMENSIONS ARE IN mm
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION

KINEMATIC ENVELOPE FOR
UNDERGROUND, AT GRADE AND ELEVATED SECTIONS
WITH BALLASTLESS TRACK
ON LEVEL/CONSTANT GRADE TANGENT TRACK
NOTES

1. ALL DIMENSIONS ARE IN mm
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA
3. KINEMATIC ENVELOPE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.

KOLKATA METRO RAIL CORPORATION LTD.

STANDARD GAUGE (1435 mm)- 750 VOLT D.C. TRACTION

KINEMATIC ENVELOPE FOR SURFACE (AT-GRADE) SECTIONS BALLASTED TRACK ON LEVEL/CONSTANT GRADE TANGENT TRACK
NOTES:

1. ALL DIMENSIONS ARE IN mm
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVE (INCLUDING CURVATURE) AND CANT SHALL BE EXTRA
3. CANT WILL BE PROVIDED BY RAISING OUTER RAIL AND SHIFTING OF THE CENTRE OF CIRCULAR TUNNEL TOWARDS INSIDE OF CURVE AND UPWARDS. THIS WILL HAVE SAME EFFECT AS ROTATING THE CIRCULAR TUNNEL ABOUT THE MID POINT OF TOP OF INNER RAIL
4. STRUCTURE GAUGE AND KINEMATIC ENVELOPE ARE VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
5. MINIMUM CLEARANCE BETWEEN KINEMATIC ENVELOPE AND STRUCTURE GAUGE IS 100mm
6. FOR DETAILS OF KINEMATIC ENVELOPE, REFER TO FIGURE NO. 1 - (TNL/AG/ELE)

COORDINATES

<table>
<thead>
<tr>
<th>POINT</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>3975</td>
</tr>
<tr>
<td>2</td>
<td>610</td>
<td>3975</td>
</tr>
<tr>
<td>3</td>
<td>1450</td>
<td>3550</td>
</tr>
<tr>
<td>4</td>
<td>1805</td>
<td>3150</td>
</tr>
<tr>
<td>5</td>
<td>1770</td>
<td>1765</td>
</tr>
<tr>
<td>6</td>
<td>1705</td>
<td>920</td>
</tr>
<tr>
<td>7</td>
<td>1705</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>1670</td>
<td>0</td>
</tr>
</tbody>
</table>

REFERENCE: PARA NO. 1.3.1(a), 1.5.1

KOLKATA METRO RAIL CORPORATION LTD.
STANDARD GAUGE (1435 mm) - 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR
LEVEL/CONSTANT GRADE TANGENT TRACK
AND CURVED TRACK WITH RADIUS = 200m
CIRCULAR TUNNEL (5200 mm DIA)
RECTANGULAR BOX TUNNEL
OUTSIDE STATIONS

CONSULTANTS

DATE: June 2011
SCALE: NOT TO SCALE
KINEMATIC ENVELOPE COMMON FOR TUNNEL AND ELEVATED TRACK

STRUCTURE GAUGE FOR ELEVATED AND AT GRADE SECTIONS

COORDINATES

<table>
<thead>
<tr>
<th>POINT</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>4025</td>
</tr>
<tr>
<td>2</td>
<td>610</td>
<td>4025</td>
</tr>
<tr>
<td>3</td>
<td>1560</td>
<td>3555</td>
</tr>
<tr>
<td>4</td>
<td>1855</td>
<td>3090</td>
</tr>
<tr>
<td>5</td>
<td>1820</td>
<td>1760</td>
</tr>
<tr>
<td>6</td>
<td>1760</td>
<td>960</td>
</tr>
<tr>
<td>7</td>
<td>1650</td>
<td>360</td>
</tr>
<tr>
<td>8</td>
<td>1755</td>
<td>360</td>
</tr>
<tr>
<td>9</td>
<td>1755</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTES:
1. ALL DIMENSIONS ARE IN MM.
2. HORIZONTAL AND VERTICAL SHAFTS DUE TO CURVE
   (INCLUDING VERTICAL CURVE) AND CANT SHALL BE EXTRA.
3. STRUCTURE GAUGE AND KINEMATIC ENVELOPE ARE VALID
   FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED
   CLOSED WHILE IN MOTION
4. MINIMUM CLEARANCE BETWEEN KINEMATIC ENVELOPE AND
   STRUCTURE GAUGE IS 150 MM
5. FOR DETAILS OF KINEMATIC ENVELOPE, REFER TO
   FIGURE NO. 1(TNL/ELE)

CONSULTANTS

DATE: June 2011

SCALE: NOT TO SCALE

STANDARD GAUGE (1435 mm): 750 VOLT D.C. TRACTION

ON ELEVATED AND AT GRADE SECTIONS (BALLASTLESS TRACK)
LEVEL/CONSTANT GRADE TANGENT TRACK
OUTSIDE STATIONS
FIGURE NO.2(AG)  REFERENCE: PARA NO. 1.3.1(c), 1.5.3

ON LEVEL/ CONSTANT GRADE TANGENT TRACK

STANDARD GAUGE (1435 mm)- 750 VOLT D.C. TRACTION

KOLKATA METRO RAIL CORPORATION LTD.

DATE:      June 2011
NOT TO SCALE

CONSULTANTS

SCALE:  NOT TO SCALE

COORDINATES

<table>
<thead>
<tr>
<th>POINT</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>4035</td>
</tr>
<tr>
<td>2</td>
<td>505</td>
<td>4035</td>
</tr>
<tr>
<td>3</td>
<td>1585</td>
<td>3515</td>
</tr>
<tr>
<td>4</td>
<td>1880</td>
<td>3085</td>
</tr>
<tr>
<td>5</td>
<td>1880</td>
<td>88</td>
</tr>
<tr>
<td>6</td>
<td>1765</td>
<td>88</td>
</tr>
<tr>
<td>7</td>
<td>1765</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTES

1. ALL DIMENSIONS ARE IN mm
2. HORIZONTAL AND VERTICAL SHIFTS DUE TO CURVES, INCLUDING VERTICAL CURVES AND CANT SHALL BE EXTRA
3. STRUCTURE GAUGE AND KINEMATIC ENVELOPE ARE VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
4. MINIMUM CLEARANCE BETWEEN KINEMATIC ENVELOPE AND STRUCTURE GAUGE IS 150 mm.
5. FOR DETAILS OF KINEMATIC ENVELOPE REFER TO FIGURE NO. 1(A0)

FIGURE NO.2(AG)  REFERENCE: PARA NO. 1.3.1(c), 1.5.3

KOLKATA METRO RAIL CORPORATION LTD.

STANDARD GAUGE (1435 mm)- 750 VOLT D.C. TRACTION

STRUCTURE GAUGE FOR
AT-GRADE SECTIONS (BALLASTED TRACK)
ON LEVEL/ CONSTANT GRADE TANGENT TRACK
OUTSIDE STATIONS

Page 33
\[
\tan \vartheta = \frac{r-D}{g/2} \\
\vartheta = \tan^{-1} \left( \frac{r-D}{g/2} \right) \\
\sin \alpha = \frac{\text{cant}}{g} \\
\alpha = \sin^{-1} \left( \frac{\text{cant}}{g} \right)
\]

Chord \( C_1 C_2 = 2 \times \left[ \frac{(r-D)}{\sin \vartheta} \times (\sin \frac{\alpha}{2}) \right] \)

\( X = C_1 C_2 \times \cos \left( 90 - \vartheta - \frac{\alpha}{2} \right) \)

\( Y = 2 \times \left[ \frac{(r-D)}{\sin \vartheta} \times (\sin \frac{\alpha}{2}) \times \sin \left( 90 - \vartheta - \frac{\alpha}{2} \right) \right] \)

Where \( r \) is internal radius of tunnel,

\( D \) = depth from Rail level to invert of tunnel

\( g \) = distance between centres of rails

\( = 1505 \text{ mm} \)

**NOTES:**

1. THE CIRCULAR TUNNEL IS ROTATED ABOUT CENTRE OF TOP OF INNER RAIL
2. FOR VALUES OF SHIFT \( 'X' \) AND \( 'Y' \) FOR VARIOUS VALUES OF CANT, REFER TO APPENDIX -4(TNL)

**FIGURE No. 3**

REFERENCE: PARA 1.6.1(B) & 1.6.2(B) (b)

KOLKATA METRO RAIL CORPORATION LTD.

STANDARD GAUGE (1435 mm) - 750 VOLT D.C. TRACTION

CONSULTANTS

DATE: August 2010

SCALE: NOT TO SCALE

SHIFT OF THE CENTRE OF CIRCULAR TUNNEL DUE TO ROTATION OF TUNNEL FOR CANT
CENTRE LINE OF TRACK

\[ H = \frac{Ca}{2} + \frac{h}{\cos \alpha} - (ab + h \times \tan \alpha) \times \sin \alpha \]

\[ ab = Ab = \text{Distance from centerline of track to Structure} \]
\[ Ca = \text{Cant applied} \]
\[ g = 1505 \text{ mm} \]
\[ \sin \alpha = \frac{\text{cant}}{g} \]

Gauge for Tangent Track at height `h`

\[ H = \frac{Ca}{2} + \frac{h}{\cos \alpha} + (Ab - h \times \tan \alpha) \times \sin \alpha \]

\[ E_1 = [ab + (h \times \tan \alpha)] \times \cos \alpha \]
\[ F_1 = [Ab - (h \times \tan \alpha)] \times \cos \alpha \]

For values of \( E_1, F_1, H_1 \) AND \( H_2 \), refer to Appendix 3(TNL), 3(ELE) AND 3(AG).

NOTES:
1. STRUCTURE GAUGE FOR ELEVATED SECTION HAS BEEN SHOWN AS A TYPICAL FIGURE.
2. THE FORMULAE FOR \( E_1, F_1, H_1 \) AND \( H_2 \) SHOWN IN THIS FIGURE WILL ALSO APPLY TO UNDER GROUND (BOX STRUCTURES) AND SURFACE SECTIONS TOO.
ab = Ab = Distance from centerline of track to Kinematic Envelope for Tangent Track at height 'h'

\[ \sin \theta = \frac{\text{cant}}{g} \]

\[ g = 1505 \text{ mm} \]

\[ \text{Ca} = \text{Cant applied} \]

\[ E = [ab + (h \times \tan \theta)] \times \cos \theta \]

\[ F = [Ab - (h \times \tan \theta)] \times \cos \theta \]

\[ H_1 = (\text{Ca}/2) + (h/\cos \theta) + (\text{Ab} - h \times \tan \theta) \times \sin \theta \]

\[ H_2 = (\text{Ca}/2) + (h/\cos \theta) - (ab + h \times \tan \theta) \times \sin \theta \]

For values of E, F, H_1 and H_2, refer to Appendix - 3A(TNL/ELE) & 3A(AG)

**NOTES:**

1. THE KINEMATIC ENVELOPE SHOWN IN THIS IS FOR UNDER GROUND AND ELEVATED SECTIONS
2. THE FORMULAE USED IN THIS FIGURE, SHALL ALSO APPLICABLE TO BALLASTED TRACK ON SURFACE SECTIONS.
NOTE:
THE VALUES OF V1 AND V2 ARE APPROXIMATELY EQUAL AND APPLY TO UNDER GROUND, ELEVATED AND SURFACE SECTIONS

<table>
<thead>
<tr>
<th>RADIUS OF VERTICAL CURVE (M)</th>
<th>V1 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>20</td>
</tr>
<tr>
<td>1600</td>
<td>19</td>
</tr>
<tr>
<td>1700</td>
<td>18</td>
</tr>
<tr>
<td>1800</td>
<td>17</td>
</tr>
<tr>
<td>1900</td>
<td>16</td>
</tr>
<tr>
<td>2000</td>
<td>15</td>
</tr>
<tr>
<td>2100</td>
<td>15</td>
</tr>
<tr>
<td>2200</td>
<td>14</td>
</tr>
<tr>
<td>2300</td>
<td>13</td>
</tr>
<tr>
<td>2400</td>
<td>13</td>
</tr>
<tr>
<td>2500</td>
<td>12</td>
</tr>
<tr>
<td>2600</td>
<td>12</td>
</tr>
<tr>
<td>2700</td>
<td>11</td>
</tr>
<tr>
<td>2800</td>
<td>11</td>
</tr>
<tr>
<td>2900</td>
<td>10</td>
</tr>
<tr>
<td>3000</td>
<td>10</td>
</tr>
</tbody>
</table>
RAIL LEVEL
CENTRE LINE OF TRACK
CENTRE LINE OF TRACK
MINIMUM = 2 X 1805 + W + A1 + A2

NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. FOR STATION ON CURVE, EXTRA CLEARANCES FOR CURVATURE AND CANT SHALL BE PROVIDED
3. VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
4. THE STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
5. CLEARANCES 'A1' AND 'A2' SHALL BE AS APPROVED / REQUIRED
6. FOR KINEMATIC ENVELOPE, REFER TO FIGURE-(TNLE)

1435
1080
5
+ _ 5
4080
1520

207
207
1080
5
+ _ 5
4080
1505

1520
MINIMUM 3810

2590
1805
1585

RAIL LEVEL
PLATFORM

MINIMUM = 2 X 1805 + W + A1 + A2

CENTRAL COLUMN
KINEMATIC ENVELOPE
LEVEL TANGENT TRACK

320
360

KOLKATA METRO RAIL CORPORATION LTD.
REFERENCE PARA NO: 2.2.5(a)
DATE: July 2009
SCALE: NOT TO SCALE
CONSULTANTS

FIGURE NO. 6(TNL)
STANDARD GAUGE (1435 mm)- 750 VOLT D.C. TRACTION
STRUCTURE GAUGE FOR
UNDER GROUND STATION WITH SIDE PLATFORMS
ON LEVEL/CONSTANT GRADE TANGENT TRACK
(RECTANGULAR BOX TUNNEL)
NOTE:
1. ALL DIMENSIONS ARE IN mm.
2. FOR STATION ON CURVE, EXTRA CLEARANCES FOR CURVATURE AND CANT SHALL BE PROVIDED
3. VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
4. THE STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
5. FOR KINEMATIC ENVELOPE, REFER TO FIGURE-1 (TNL/ELE)

FIGURE NO. 6A (TNL)
REFERENCE PARA NO: 2.2.5 (a)
KOLKATA METRO RAIL CORPORATION LTD
STANDARD GAUGE (1435 mm) - 750 VOLT D.C. TRACTION
DATE: July 2009
SCALE: NOT TO SCALE
STRUCTURE GAUGE FOR UNDER GROUND STATION
WITH AN ISLAND PLATFORM ON LEVEL/CONSTANT GRADE TANGENT TRACK
CLEARANCE BETWEEN ADJOINING STRUCTURE GAUGES FOR DIFFERENT TRACK CENTRES

<table>
<thead>
<tr>
<th>TRACK CENTRES (A)</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>3800</td>
<td>290</td>
<td>500</td>
<td>280</td>
<td>160</td>
<td>90</td>
</tr>
<tr>
<td>3900</td>
<td>390</td>
<td>600</td>
<td>380</td>
<td>260</td>
<td>190</td>
</tr>
<tr>
<td>4000</td>
<td>490</td>
<td>700</td>
<td>480</td>
<td>360</td>
<td>290</td>
</tr>
<tr>
<td>4100</td>
<td>590</td>
<td>800</td>
<td>580</td>
<td>460</td>
<td>390</td>
</tr>
<tr>
<td>4150</td>
<td>640</td>
<td>850</td>
<td>680</td>
<td>510</td>
<td>440</td>
</tr>
<tr>
<td>4200</td>
<td>690</td>
<td>900</td>
<td>680</td>
<td>560</td>
<td>490</td>
</tr>
<tr>
<td>4250</td>
<td>740</td>
<td>950</td>
<td>730</td>
<td>610</td>
<td>540</td>
</tr>
</tbody>
</table>

NOTES:
1) ALLOWANCE FOR CURVE SHALL BE EXTRA, HOWEVER THE TRACK CENTRES (A) WILL NOT BE AFFECTED FOR CURVES OF RADIUS 1000 M AND FLATTER IF THERE IS NO STRUCTURE BETWEEN THE TRACKS. IN CASE OF A STRUCTURE BETWEEN THE TRACKS, (A) SHALL BE CALCULATED.
2) VERTICAL THROW DUE TO VERTICAL CURVE IF ANY SHALL BE EXTRA
3) STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION
4) THE TRACK CENTRES DOES NOT ACCOUNT FOR PROVISION OF CROSS OVERS, STRUCTURES & OTHER SERVICES, IF REQUIRED, IN BETWEEN THE TRACKS
5) ALL DIMENSIONS ARE IN mm

TYPICAL FOR 4 M WIDE SIDE PLATFORMS.

FIGURE NO. 6(ELE) REFERENCE: PARA NO: 2.2.5 (b)
KOLKATA METRO CORPORATION LTD.
STANDARD GAUGE (1435 mm)- 750 VOLT D.C. TRACTION
STRUCTURE GAUGE AT ELEVATED STATION
WITH 4 M WIDE SIDE PLATFORMS
ON LEVEL /CONSTANT GRADE TRACK

CONSULTANTS
DATE: July 2009
SCALE:
NOT TO SCALE

Page 40
STATEMENT SHOWING CLEARANCES BETWEEN ADJOINING STRUCTURE GAUGES FOR DIFFERENT TRACK CENTRES

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>3800</td>
<td>270</td>
<td>490</td>
<td>260</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>3900</td>
<td>370</td>
<td>590</td>
<td>360</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>4000</td>
<td>470</td>
<td>690</td>
<td>460</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>4100</td>
<td>570</td>
<td>790</td>
<td>560</td>
<td>340</td>
<td>340</td>
</tr>
<tr>
<td>4150</td>
<td>620</td>
<td>810</td>
<td>610</td>
<td>390</td>
<td>390</td>
</tr>
<tr>
<td>4200</td>
<td>670</td>
<td>860</td>
<td>660</td>
<td>440</td>
<td>440</td>
</tr>
<tr>
<td>4250</td>
<td>720</td>
<td>910</td>
<td>710</td>
<td>490</td>
<td>490</td>
</tr>
</tbody>
</table>

NOTES:
1. ALLOWANCE FOR CURVE/CANT SHALL BE EXTRA. HOWEVER THE TRACK CENTRES WILL NOT INCREASE FOR PERMISSIBLE CURVES UPTO RADIUS OF 1000 M.
2. VERTICAL THROW DUE TO VERTICAL CURVES SHALL BE EXTRA.
3. STRUCTURE GAUGE IS VALID FOR VEHICLES WITH SEALED WINDOWS AND DOORS CLOSED WHILE IN MOTION.
4. THE TRACK CENTRES DOES NOT ACCOUNT FOR PROVISION OF CROSS OVERS, STRUCTURES & OTHER SERVICES, IF REQUIRED IN BETWEEN TRACKS.
5. ALL DIMENSIONS ARE IN mm.