

# MAHARASHTRA METRO RAIL CORPORATION LIMITED (PUNE METRO RAIL PROJECT)

## BID DOCUMENTS FOR

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works, Development of Office/Stores etc. within PMC and PCMC area for Pune Metro Rail Project.

**Tender No. P1Misc-32/2024**

**BID DOCUMENT  
(Part- 1 to 4)**



**Maharashtra Metro Rail Corporation Limited**


Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005,  
Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Parts of the Bid Document**

<b>Part</b>	<b>Name of the Document</b>
<b>NIT</b>	<b>Notice Inviting Tender</b>
<b>PART – 1</b>	<b>Bidding Procedures</b>
<b>PART – 2</b>	<b>Work Requirement</b>
<b>PART – 3</b>	<b>Conditions of Contract</b>
<b>PART - 4</b>	<b>Financial Bid</b>

	<p align="center"><b><u>E-TENDER NOTICE</u></b></p> <p align="center"><b>MAHARAHSTRA METRO RAIL CORPORATION LIMITED</b></p> <p align="center">(A joint venture of Govt. of India &amp; Govt. of Maharashtra Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005.</p> <p align="center"><b>E-mail id:</b> <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a> <b>Website:</b> <a href="http://www.punemetrorail.org">www.punemetrorail.org</a> e-tender portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> <b>(PUNE METRO RAIL PROJECT)</b></p>
<p><b>Tender No. P1Misc-32/2024</b></p> <p><b>Name of Work:</b> Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair &amp; maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture &amp; Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.</p>	<p align="right"><b>Date: 16 January 2024</b></p>
<b>Key Details:</b>	
Completion Period	<b>24 Months (02 Years)</b> from the date specified in the LOA.
Document on Sale	Tender Documents can be downloaded from 16.00 hrs. On 16/01/2024 to 16.00 Hrs. on 09/02/2024 from e-tender portal of Govt. of Maharashtra i.e <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a>
Cost of Document	<p><b>INR 59,000/-</b> (inclusive of applicable GST), non-refundable payable through e-payment by Credit Card / Debit Card / Net Banking etc on e-tender of Govt. of Maharashtra portal, as per procedure given in tender document.</p> <p>Also refer Bid Data Sheet (BDS) of Tender Document for further information. Agencies registered as MSME (<b>only</b> in category: <b>Micro or Small</b>) are exempted from Cost of Tender Documents, subject to submission of Certificate of Registration as MSME.</p>
Pre-Bid Meeting	At 11.00 hrs. On Dt. 25.01.2024 at the office of ED/Procurement, Maha- Metro. Bidder's queries must be submitted through e-mail ID: <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a> OR in hard copy to ED (Procurement) office before the stipulated date & time of Pre-Bid meeting. (The pre-bid meeting may be arranged through Video Conference, in that case a link to join the meeting shall be published on eTender Portal) <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a>
Bid Security (EMD)	<p>The Bid Security / EMD amounting to INR: 30,92,000/- (Thirty Lakhs Ninety-Two Thousand Only) shall be in the form of Irrevocable Bank Guarantee as required in the Tender Document.</p> <p>Agencies registered as MSE (in category Micro or Small) are exempted from the submission of EMD; instead, they shall submit Certificate of registration as MSME and Bid Securing Declaration.</p>
Date & Time of submission of Tender	Online submission up till 16.00 Hrs. on Dt. 09/02/2024 on , e-tender portal.
Date & Time of Opening of Tender	On Dt. 10/02/2024 after 15.00 Hours in Procurement Department, Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005.
<ol style="list-style-type: none"> <li>1. To view this tender notice (NIT), interested bidder may visit the Maha-Metro website <a href="http://www.punemetrorail.com">www.punemetrorail.com</a>, or CPP portal <a href="https://eprocure.gov.in">https://eprocure.gov.in</a></li> <li>2. Sale of document, e-Payment procedure, submission and other details are available on e-tender portal of Govt of Maharashtra i. e <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> from 16.00 hrs. On 16/01/2024 to 16.00 Hrs. on 09/02/2024.</li> <li>3. The bidder shall bear all costs associated with the preparation and submission of the bid. Maha-Metro, in no case, will be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.</li> </ol>	

**Executive Director/Procurement & Contracts**  
**Maha-Metro, Pune**

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Section XII	Preamble
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# MAHARASHTRA METRO RAIL CORPORATION LIMITED (PUNE METRO RAIL PROJECT)

## BID DOCUMENTS

### FOR

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

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**Tender No. P1Misc-32/2024**

**PART 1: BIDDING PROCEDURE**



## Maharashtra Metro Rail Corporation Limited

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

## **Part- 1 - Bidding Procedures**

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Section I	Instructions to Bidders
Section II	Bid Data Sheet
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Section III	Evaluation and Qualification Criteria
Section IV	Bidding Forms
Section V	Eligibility Criteria and Social and Environmental Responsibility
Section VI	Agency Policy - Corrupt and Fraudulent Practices

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)****BID DOCUMENTS****FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**Tender No. P1Misc-32/2024****PART 1: BIDDING PROCEDURE  
SECTION I: INSTRUCTIONS TO BIDDERS****Maharashtra Metro Rail Corporation Limited****Civil Court Metro Station, Nyayamurti Ranade Path, Pune-****411005. Tel- 020-7410004067/68****E-mail: [tender.pmrp@mahametro.org](mailto:tender.pmrp@mahametro.org)****Website: [www.punemetrorail.org](http://www.punemetrorail.org)**

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## Section I. Instructions to Bidders

### A. General

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|--|--|
| <b>1. Scope of Bid</b>                     | <p>1.1 In connection with the Invitation for Bids <b>specified in the Bid Data Sheet (BDS)</b>, the Employer, as <b>specified in the BDS</b>, issues these Bidding Documents for the procurement of Works as specified in Section VII, Works Requirements. The name, identification, and number of Bid is as <b>specified in the BDS</b>.</p> <p>1.2 Throughout these Bidding Documents:</p> <ul style="list-style-type: none"> <li>(a) the term “in writing” means communicated in written form and delivered against receipt;</li> <li>(b) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and</li> <li>(c) “day” means calendar day.</li> </ul> |
| <b>2. Source of Funds</b>                  | <p>2.1 The Employer <b>specified in the BDS</b> has received or has applied for financing (hereinafter called “funds”) from the funding agency (<b>as specified in BDS</b>) toward the project named <b>in the BDS</b>. The Employer intends to apply a portion of the funds to eligible payments under the contract(s) for which these Bidding Documents are issued.</p>  |
| <b>3. Corrupt and Fraudulent Practices</b> | <p>3.1 The Agency requires compliance with its policy in regard to corrupt and fraudulent practices as set forth in Section VI.</p> <p>3.2 "The Bidder/Contractor grants the Employer, the EIB and auditors appointed by either of them, as well as any authority or European Union Institution or body having competence under European Union law, the right to inspect and copy the books and records of the bidder, contractor, supplier or consultant in connection with any EIB-financed contract".</p>   |
| <b>4. Eligible Bidders</b>                 | <p>4.1 A Bidder may be a firm that is a private entity, a government-owned entity—subject to ITB 4.4—or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct</p>   |

all business for and on behalf of any and all the members of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution. **Unless specified in the BDS**, there is no limit on the number of members in a JV.

- 4.2 A Bidder shall not have a conflict of interest. Any Bidder found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest for the purpose of this bidding process, if the Bidder:
- (a) directly or indirectly controls, is controlled by or is under common control with another Bidder; or
  - (b) receives or has received any direct or indirect subsidy from another Bidder; or
  - (c) has the same legal representative as another Bidder; or
  - (d) has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or
  - (e) Participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which such Bidder is involved. However, this does not limit the inclusion of the same sub-contractor in more than one bid; or
  - (f) any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the bid; or
  - (g) any of its affiliates has been hired (or is proposed to be hired) by the Employer as Engineer for the Contract implementation; or
  - (h) has a close business or family relationship with a professional staff of the Employer (or of the project implementing agency, or of a recipient of a part of the loan) who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the conflict stemming from such relationship has been resolved in a manner acceptable to the Agency throughout the procurement process and execution of the contract.

- (i) The assessment of any potential conflict of interest will be conducted as per the EIB Guide to Procurement

- 4.3 “Pursuant to its Sanctions Policy, the Bank shall not provide or otherwise make funds available, directly or indirectly, to or for the benefit of an individual or entity that is subject to financial sanctions imposed by the EU, either autonomously or pursuant to the financial sanctions decided by the United Nations Security Council on the basis of article 41 of the UN Charter
- 4.4. The Agency’s eligibility criteria to bid are described in **Section V – Eligibility criteria and social and environmental responsibility.**
- 4.5 A Bidder shall not be under suspension from bidding by the Employer as the result of the operation of a Bid Security.
- 4.6 This bidding is open only to prequalified Bidders unless **specified in the BDS.**
- 4.7 A Bidder shall provide such evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request.
- 4.8 Bidders are required as a condition of admission to eligibility, to execute and attach the Covenant of Integrity and the Environmental and Social Covenant in the form indicated in Section IV: Bidding Forms. The covenants have to be signed by all members of the JV/consortium

## **5. Eligible Materials, Equipment, and Services**

- 5.1 The materials, equipment and services to be supplied under the Contract and financed by the Agency may have their origin in any country subject to the restrictions specified in Section V, Eligibility criteria and social and environmental responsibility, and all expenditures under the Contract will not contravene such restrictions. At the Employer’s request, Bidders may be required to provide evidence of the origin of materials, equipment and services.

## **B. Contents of Bidding Documents**

## **6. Sections of Bidding Documents**

- 6.1 The Bidding Documents consist of Parts 1, 2, 3 and 4, which include all the Sections specified below, and which should be read in conjunction with any Addenda issued in accordance with ITB 8.

### **Notice Inviting Tender (NIT)**

Part- 1 - Bidding Procedures

Section I Instructions to Bidders

Section II Bid Data Sheet

Annexure-II-A Deleted



Annexure-II-B	Deleted
Annexure II-C	Tool Kit for e-tender
Annexure-II-D	Grounds for Exclusion
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Section IX	Particular Conditions (PC)
Annexure - IX-A	Dispute Board
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Section X	Contract Forms
Section XI	SHE Manual (or Conditions of Contract on SHE requirements)

## PART- 4 - Financial Bid &amp; Bill of Quantities

Section XII	Preamble
	Bill of Quantities

6.2 The Invitation for Bids (Notice Inviting Tender) i.e. NIT issued by the Employer is part of the Bidding Documents.

6.3 Unless obtained directly by the bidder concerned from the Employer's office (as mentioned in NIT) or Employer's E-tender portal, the Employer is not responsible for the completeness of the Bidding Documents, responses to requests for clarification, the minutes of the pre-Bid meeting (if any), or Addenda to the Bidding Documents in accordance with ITB 8. (Downloaded / Uploaded by Bidder). In case of any contradiction, documents available at Employer's Office or uploaded on E-Tender portal of Employer shall prevail.

6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents and to furnish with its bid all information and documentation as is required by the Bidding Documents.

Failure to comply with the requirements of the Bidding Documents and to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents, in every respect will be at the Bidder's risk and may result in rejection of its Bid.

6.5. The Bidder shall not make or cause to be made any alteration, erasure or obliteration to the text of the Bid Documents issued by Employer or uploaded on the E-tender portal of Employer, which shall otherwise results in rejection of its Bid.

6.6. The documents including the Bid Document provided by Employer are and shall remain or becomes the property of Employer and are transmitted to the Bidders solely for the purpose of preparation and the submission of a Bid in accordance herewith. The provisions of this Para shall also apply *mutatis mutandis* to the Bids and all other documents submitted by the Bidders, and Employer will not return to the Bidders any Bid, document or any information provided along therewith.

## 7. Clarification of Bidding

7.1 A Bidder requiring any clarification of the Bidding Documents shall contact the Employer in writing at the Employer's

**Documents, Site Visit, Pre-Bid Meeting**

address **specified in the BDS** or raise its enquiries during the pre-bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received on or before the date specified in this document. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Documents in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. If so specified in the BDS, the Employer shall also promptly publish its response at the web page identified in the BDS. Should the clarification result in changes to the essential elements of the Bidding Documents, the Employer shall amend the Bidding Documents following the procedure under ITB 8 and ITB 22.2 **OR as provided for in BDS in consonance with E-Tendering System.**

- 7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

Any site / work information given in this bidding document is for guidance only. It shall be deemed that the Bidder has undertaken a visit to the Work Site of the Works and is aware of and has ascertained itself, the prevailing site conditions, traffic, location, surroundings, climate, demography availability of power, water and other utilities, raw materials, required consumables, access to Site, handling and storage of materials, weather data, applicable laws and regulations, and any other matter considered relevant by it prior to the submission of the Bid.

- 7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.
- 7.4 If so specified in the BDS, the Bidder's designated representative is invited to attend a pre-bid meeting. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage **(as specified in BDS).**

- 7.5 The Bidder is requested, as far as possible, to submit any questions in writing, to reach the Employer not later than one week before the meeting **or as specified in BDS**.
- 7.6 Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by Bidders, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Documents in accordance with ITB 6.3. Any modification to the Bidding Documents that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to ITB 8 and not through the minutes of the pre-bid meeting. Non-attendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.
- 7.7 Bidders should alert the Employer in writing with a copy to Funding Agency (EIB) to [procurementcomplaints@eib.org](mailto:procurementcomplaints@eib.org) in case they consider that certain clauses or technical specifications of the Tender Documents might limit international competition or introduce an unfair advantage to some bidders

#### 8. Amendment of Bidding Documents

- 8.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Documents by issuing addenda.
- 8.2 Any addendum /corrigendum issued by Employer shall be part of the Bidding Documents and shall be communicated in writing to all who have obtained the Bidding Documents from the Employer in accordance with ITB 6.3. The Employer shall also promptly publish the addendum on the Employer's web page in accordance with ITB 7.1. **or as specified in BDS**.
- 8.3 To give Bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at its discretion, extend the deadline for the submission of bids, pursuant to ITB 22.2

### C. Preparation of Bids

#### 9. Cost of Bidding

- 9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

#### 10. Language of Bid

- 10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language **specified in the**

**BDS.** Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language **specified in the BDS**, in which case, for purposes of interpretation of the Bid, such translation shall govern.

#### **11.Documents Comp rising the Bid**

11.1 The Bid shall comprise the following:(refer **BDS for additional requirement**)

- (a) Letter of Bid in accordance with ITB 12;
- (b) completed schedules as required, including Price Schedules, in accordance with ITB 12 and 14;
- (c) Bid Security or Bid-Securing Declaration, in accordance with ITB 19.1 **(as specified in BDS)**
- (d) alternative bids, if permissible, in accordance with ITB 13 **(as specified in BDS)**;
- (e) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;
- (f) Covenant of Integrity and Environmental & Social Covenant duly signed, in accordance with ITB 12;
- (g) Documentary evidence in accordance with ITB 17 establishing the Bidder's continued qualified status or, if post-qualification applies, as specified in accordance with ITB 4.5, the Bidder's qualifications to perform the contract if its Bid is accepted;
- (h) Technical Proposal in accordance with ITB 16;
- (i) Any other document **required in the BDS**.

11.2 In addition to the requirements under ITB 11.1, bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful bid shall be signed by all members and submitted with the bid, together with a copy of the proposed Agreement.

11.3 The Bidder shall furnish in the Letter of Bid information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid **(as specified in BDS)**.

#### **12.Letter of Bid and Schedules**

12.1 The Letter of Bid, the Statement of Integrity and Schedules, including the Bill of Quantities for unit price contracts or the schedule of price in case of lump sum contracts, shall be prepared using the relevant forms furnished in Section IV, Bidding Forms. The Letter of Bid and the Statement of Integrity must be completed without any alterations to the

text, and no substitutes shall be accepted except as provided under ITB 20.4. All blank spaces shall be filled in with the information requested.

12.2. The Letter of Bid with all Schedules/ Forms shall be completed and signed by an authorized and empowered representative of the Bidder. If the Bidder comprises a JV/Consortium, the Letter of Bid shall be signed by an authorized representative of the **Lead Member**. Signatures on the Letter of Bid shall be witnessed and dated. Copies of relevant powers of attorney shall be attached.

### **13. Alternative Bids**

**13.1 Unless otherwise specified in the BDS**, alternative bids shall not be considered.

13.2 When alternative times for completion are explicitly invited, a statement to that effect **will be included in the BDS**, as will the method of evaluating different times for completion.

13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Documents must first price the Employer's design as described in the Bidding Documents and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the basic technical requirements shall be considered by the Employer **(as specified in BDS)**

**13.4 When specified in the BDS**, Bidders are permitted to submit alternative technical solutions for specified parts of the Works, and such parts **will be identified in the BDS**, as will the method for their evaluating, and described in Section VII, Works Requirements.

### **14. Bid Prices and Discounts**

14.1 The prices and **discounts** quoted by the Bidder in the Letter of Bid and in the Schedules shall conform to the requirements specified below. **(or as specified in BDS)**

14.2 The Bidder shall submit a bid for the whole of the Works described in ITB 1.1, by filling in price(s) for all items of the works, as identified in Section IV, Bidding Forms. In case of admeasurement contracts, the Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder shall be deemed covered by the rates for other items in the Bill of Quantities and will not be paid for separately by the Employer. An item not listed in the priced

Bill of Quantities shall be assumed to be not included in the Bid, and provided that the Bid is determined substantially responsive notwithstanding this omission, the average price of the item quoted by substantially responsive bidders will be added to the bid price and the equivalent total cost of the bid so determined will be used for price comparison.  
**(or as specified in BDS)**

14.3 The price to be quoted in the Letter of Bid shall be the total price of the Bid, excluding any discounts offered **(or as specified in BDS)**.

14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Bid **(or as specified in BDS)**

**14.5 Unless otherwise specified in the BDS** and the Contract, the rate(s) and price(s) quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract. In such a case, the Bidder shall furnish the indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data and the Employer may require the Bidder to justify its proposed indices and weightings.

14.6 If so specified in ITB 1.1, bids are being invited for individual lots (contracts) or for any combination of lots (packages). Bidders wishing to offer discounts for the award of more than one Contract shall specify in their bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Discounts shall be submitted in accordance with ITB 14.4, provided the bids for all lots (contracts) are opened at the same time **or as specified in the BDS**.

14.7 Unless otherwise **specified in the BDS**, all duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date **28 days** prior to the deadline for submission of bids, shall be included in the rates and prices and the total Bid Price submitted by the Bidder.

## **15. Currencies of Bid and Payment**

15.1 The currency (ies) of the bid and the currency (ies) of payments shall be **as specified in the BDS**.

15.2 Bidders may be required by the Employer to justify, to the Employer's satisfaction, their local and foreign currency requirements, and to substantiate that the amounts included in the prices shown in the Schedule of Adjustment Data in the Appendix to Bid are reasonable, in which case

a detailed breakdown of the foreign currency requirements shall be provided by Bidders.

**16. Documents  
Comprising the  
Technical  
Proposal**

16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV – Bidding Forms, in sufficient detail to demonstrate the adequacy of the Bidder's proposal to meet the work requirements and the completion time.

**17. Documents  
Establishing the  
Qualifications of  
the Bidder**

17.1 In accordance with Section III, Evaluation and Qualification Criteria, to establish that the Bidder continues to meet the criteria used at the time of prequalification or at the time of actual bidding (as the case may be), the Bidder shall provide in the corresponding information sheets included in Section IV, Bidding Forms, updated information on any assessed aspect that changed from that time, or if post-qualification applies as specified in ITB 4.5, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV, Bidding Forms.

17.2 If a margin of preference applies as specified in accordance with ITB 33.1, domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility specified in accordance with ITB 33.1 (as detailed in BDS)

17.3 Any change in the structure or formation of a Bidder after being prequalified and invited to Bid (including, in the case of a JV, any change in the structure or formation of any member thereto) shall be subject to the written approval of the Employer prior to the deadline for submission of Bids. Such approval shall be denied if (i) as a consequence of the change, the Bidder no longer substantially meets the qualification criteria set forth in Section III, Qualification Criteria and Requirements; or (ii) in the opinion of the Employer, the change may result in a substantial reduction in competition. Any such change should be submitted to the Employer not later than fourteen (14) days after the date of the Invitation for Bids. **(or as specified in BDS)**

**18. Period of Validity  
of Bids**

18.1 Bids shall remain valid for the period **specified in the BDS** from the bid submission deadline date prescribed by the Employer in accordance with ITB 22.1. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

18.2 In exceptional circumstances, prior to the expiration of the bid validity period, the Employer may request Bidders to extend the period of validity of their bids. The request and the responses shall be made in writing. If a bid security is



requested in accordance with ITB 19, it shall also be extended for **twenty-eight (28)** days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its bid, except as provided in ITB 18.3.

**18.3 Unless specified in BDS**, if the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial bid validity, the Contract price shall be determined as follows:

- (a) In the case of fixed price contracts, the Contract price shall be the bid price adjusted by the factor **specified in the BDS**.
- (b) In the case of adjustable price contracts, no adjustment shall be made.
- (c) In any case, bid evaluation shall be based on the bid price without taking into consideration the applicable correction from those indicated above.

## **19. Bid Security**

**19.1** The Bidder shall furnish as part of its bid, a bid security **as specified in the BDS**, in original form and, in the case of a bid security, in the amount and currency **specified in the BDS**.

**19.2** Agencies registered as MSE (in category Micro or Small) are exempted from the submission of EMD; instead, they shall submit Certificate of registration as MSME and Bid Securing Declaration. A Bid-Securing Declaration shall use the form included in Section IV, Bidding Forms, **as specified in BDS**

**19.3** If a bid security is specified pursuant to ITB 19.1, the bid security shall be a demand guarantee in any of the following forms at the Bidder's option:

- (a) an unconditional guarantee issued by any Scheduled bank in India;
- (b) an irrevocable letter of credit;
- (c) Demand Draft, from any Scheduled Bank in India.
- (d) another security **specified in the BDS**,

from a reputable source from an eligible country as specified in Section V-Eligibility criteria and social and environmental responsibility. If the unconditional guarantee is issued by a financial institution located outside the Employer's Country, the issuing financial institution shall

have a correspondent financial institution located in the Employer's Country to make it enforceable. In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section IV, Bidding Forms, or in another substantially similar format approved by the Employer prior to bid submission. The bid security shall be valid for twenty-eight (28) days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.

- 19.4 Any bid not accompanied by a substantially responsive **Bid security** or **Bid-Securing Declaration** (as the case may be) shall be rejected by the Employer as non-responsive.
- 19.5 The bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's signing the Contract and furnishing the performance security pursuant to ITB 42.( **Replaced in BDS**)
- 19.6 The bid security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required performance security.
- 19.7 The bid security may be forfeited or the Bid-Securing Declaration executed:
- (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letter of Bid, or any extension thereto provided by the Bidder; or
  - (b) If the Bidder submit fake / forged / fabricated /false documents as well as false & misleading information /data with his Bid which fails the authenticity verifications initiated by MAHA-Metro.
  - (c) If the Bidder tamper/ edit/ mutilate the Bid document and associated information/data and submit the same with his Bid.
  - (d) If the successful Bidder fails to:
    - (i) sign the Contract in accordance with ITB 41; or
    - (ii) furnish a performance security in accordance with ITB 42.
    - (iii) authenticate and verification of performance security
- 19.8 The bid security or a Bid-Securing Declaration of a JV shall be in the name of the JV that submits the bid. If the JV has

not been legally constituted into a legally enforceable JV at the time of bidding, the bid security or the Bid-Securing Declaration shall be in the names of all future members as named in the letter of intent referred to in ITB 4.1 and ITB 11.2. **or as Specified in BDS, Section-II**

19.9 If a bid security is **not required in the BDS pursuant to ITB 19.1**, and

- (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereto provided by the Bidder, or
- (b) if the successful Bidder fails to sign the Contract in accordance with ITB 41; or furnish a performance security in accordance with ITB 42;

the Employer may, **if provided for in the BDS**, declare the Bidder ineligible to be awarded a contract by the Employer for a period of time **as stated in the BDS**.

## 20. Format and Signing of Bid

20.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 11 and clearly mark it "ORIGINAL." Alternative bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit one set of copies of the bid, in the number **specified in the BDS** and clearly mark them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail. **(Replaced in BDS)**

20.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation **as specified in the BDS** and shall be attached to the bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the bid where entries or amendments have been made shall be signed or initialed by the person signing the bid. **(Replaced in BDS)**

20.3 In case the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives. **(As specified in BDS)**

20.4 Any inter-lineation, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the bid.

## D. Submission and Opening of Bids (as specified in BDS)

**21. Sealing and Marking of Bids**  
(Replaced In BDS)

21.1 The Bidder shall enclose the original and one set of all copies of the bid, including alternative bids, if permitted in accordance with ITB 13, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL", "ALTERNATIVE" and "COPY." These envelopes containing the original and the copies shall then be enclosed in one single envelope.

21.2 The inner and outer envelopes shall:

- (a) bear the name and address of the Bidder;
- (b) be addressed to the Employer in accordance with ITB 22.1;
- (c) bear the specific identification of this bidding process specified in the BDS 1.1; and
- (d) bear a warning not to open before the time and date for bid opening.

21.3 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the bid.

**22. Deadline for Submission of Bids**

22.1 Bids must be received by the Employer at the address and no later than the date and time **specified in the BDS**. **When so specified in the BDS**, bidders shall have the option of submitting their bids electronically. Bidders submitting bids electronically shall follow the electronic bid submission procedures **specified in the BDS**.

22.2 The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

**23. Late Bids**

23.1 The Employer shall not consider any bid that arrives after the deadline for submission of bids, in accordance with ITB 22. Any bid received by the Employer after the deadline for submission of bids shall be declared late, rejected, and returned unopened to the Bidder **or as specified in BDS**

**24. Withdrawal, Substitution, and Modification of Bids**

24.1 **Unless specified in BDS**, A Bidder may withdraw, substitute, or modify its bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2. The corresponding substitution or modification of the bid must accompany the respective written notice. All notices must be:

- (a) prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawals notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION;" and
- (b) received by the Employer prior to the deadline prescribed for submission of bids, in accordance with ITB 22.

24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.

24.3 No bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof.

## 25. Bid Opening

25.1 Except in the cases specified in ITB 23 and 24, the Employer shall publicly open and read out in accordance with ITB 25 all bids received by the deadline (regardless of the number of bids received), at the date, time and place **specified in the BDS**, in the presence of Bidders' designated representatives and anyone who choose to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 22.1, shall be **as specified in the BDS**.

25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelope with the corresponding bid shall not be opened, but returned to the Bidder. No bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at bid opening. Next, envelopes marked "SUBSTITUTION" shall be opened and read out and exchanged with the corresponding bid being substituted, and the substituted bid shall not be opened, but returned to the Bidder. No bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at bid opening. Envelopes marked "MODIFICATION" shall be opened and read out with the corresponding bid. No bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at bid opening. Only bids that are opened and read out at bid opening shall be considered further.

25.3 All other envelopes shall be opened one at a time, reading out: the name of the Bidder and whether there is a modification; the total Bid Price, per lot (contract) if applicable, including any discounts and alternative bids; the

presence or absence of a bid security and any other details as the Employer may consider appropriate. Only discounts and alternative bids read out at bid opening shall be considered for evaluation. The Letter of Bid and the Schedules are to be initialed by a minimum of three representatives of the Employer attending bid opening. The Employer shall neither discuss the merits of any bid nor reject any bid (except for late bids, in accordance with ITB 23.1) **(Replaced in BDS)**

- 25.4 The Employer shall prepare a record of the bid opening that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, substitution, or modification; the Bid Price, per lot (contract) if applicable, including any discounts and alternative bids; and the presence or absence of a bid security. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders. **(Replaced in BDS)**

## **E. Evaluation and Comparison of Bids**

### **26. Confidentiality**

- 26.1 Information relating to the examination, evaluation, and comparison of the bids, and qualification of the Bidders and recommendation of contract award shall not be disclosed to Bidders or any other persons not officially concerned with the bidding process until information on Contract award is communicated to all Bidders in accordance with ITB 40.
- 26.2 Any attempt by a Bidder to influence the Employer in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, or Contract award decisions may result in the rejection of its bid.
- 26.3 Notwithstanding ITB 26.2, from the time of bid opening to the time of Contract award, if a Bidder wishes to contact the Employer on any matter related to the bidding process, it shall do so in writing.
- 26.4 The Bank requires that tenderers and (sub-) contractors participating in a tender procedure or a contract under a Bank-financed project shall not violate or have violated any intellectual property rights.

### **27. Clarification of Bids**

- 27.1 To assist in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its bid, given a reasonable time for a response. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The

Employer's request for clarification and the response shall be in writing. No change, including any voluntary increase or decrease, in the prices or substance of the bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids, in accordance with ITB 31.

27.2 If a Bidder does not provide clarifications of its bid by the date and time set in the Employer's request for clarification, its bid may be rejected.

## **28. Deviations, Reservations, and Omissions**

28.1 During the evaluation of bids, the following definitions apply:

- (a) "Deviation" is a departure from the requirements specified in the Bidding Documents;
- (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Documents; and
- (c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Documents.

## **29. Determination of Responsiveness**

29.1 The Employer's determination of a bid's responsiveness is to be based on the contents of the bid itself, as defined in ITB11.

29.2 A substantially responsive bid is one that meets the requirements of the Bidding Documents without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that,

- (a) if accepted, would:
  - (i) affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or
  - (ii) limit in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the Bidder's obligations under the proposed Contract; or
- (b) if rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive bids.

29.3 The Employer shall examine the technical aspects of the bid submitted in accordance with ITB 16, in particular, to confirm that all requirements of Section VII, Works Requirements have been met without any material deviation, reservation or omission.

29.4 If a bid is not substantially responsive to the requirements of the Bidding Documents, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

**30. Nonmaterial  
Nonconformities**

30.1 Provided that a bid is substantially responsive, the Employer may waive any nonmaterial non-conformity in the Bid.

30.2 Provided that a bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

30.3 Provided that a bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component.

**31. Correction of  
Arithmetical  
Errors**

31.1 Provided that the bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

- (a) Only for admeasurement contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;
- (b) Only for admeasurement contracts, if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and
- (c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless, only for admeasurement contracts, the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.



- 31.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 31.1 shall result in the rejection of the Bid.
- 32. Conversion to Single Currency**
- 32.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency **as specified in the BDS**.
- 33. Margin of Preference**
- 33.1 Unless otherwise specified in the BDS**, a margin of preference for domestic bidders shall not apply.
- 34. Subcontractors**
- 34.1 Unless otherwise stated in the BDS**, the Employer does not intend to execute any specific elements of the Works by sub-contractors selected in advance by the Employer.
- 34.2 In case of Prequalification, the Bidder's Bid shall name the same specialized subcontractor as submitted in the prequalification application and approved by the Employer, or may name another specialized subcontractor meeting the requirements specified in the prequalification phase.
- 34.3 In case of Post-qualification, the Employer may permit subcontracting for certain specialized works as indicated in Section III Experience. When subcontracting is permitted by the Employer, the specialized sub-contractor's experience shall be considered for evaluation. Section III describes the qualification criteria for sub-contractors **or as specified in BDS**.
- 35. Evaluation of Bids**
- 35.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.
- 35.2 To evaluate a bid, the Employer shall consider the following **(as specified in BDS)**:
- (a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Schedules, but including Day work items, where priced competitively;
  - (b) price adjustment for correction of arithmetic errors in accordance with ITB 31.1;
  - (c) price adjustment due to discounts offered in accordance with ITB 14.4;
  - (d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 32;

(e) price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 30.3;

(f) the additional evaluation factors as specified in Section III, Evaluation and Qualification Criteria.

35.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.

35.4 If these Bidding Documents allows Bidders to quote separate prices for different lots (contracts), the methodology to determine the lowest evaluated price of the lot (contract) combinations, including any discounts offered in the Letter of Bid Form, is specified in Section III, Evaluation and Qualification Criteria.

35.5 An Abnormally Low Bid is one where the Bid price, in combination with other elements of the Bid, appears so low that it raises material concerns as to the capability of the Bidder in regards to the Bidder's ability to perform the Contract for the offered Bid Price. In the event of identification of a potentially Abnormally Low Bid, the Employer shall seek written clarifications from the Bidder, including detailed price analysis of its Bid price in relation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the Bidding document. After evaluation of the price analyses, in the event that the Employer determines that the Bidder has failed to demonstrate its capability to perform the Contract for the offered Bid Price, the Employer shall reject the Bid.

#### **36. Comparison of Bids**

36.1 The Employer shall compare the evaluated prices of all substantially responsive bids established in accordance with ITB 35.2 to determine the lowest evaluated bid.

#### **37. Qualification of the Bidder**

37.1 The Employer shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated and substantially responsive bid either continues to meet (if prequalification applies) or meets (if post-qualification applies) the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.

37.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17.1.

37.3 An affirmative determination shall be a prerequisite for award of the Contract to the Bidder. A negative determination shall result in disqualification of the bid, in

which event the Employer shall proceed to the next lowest evaluated bid to make a similar determination of that Bidder's qualifications to perform satisfactorily.

**38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids**

38.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.

**F. Award of Contract**

**39. Award Criteria**

39.1 Subject to ITB 38.1, the Employer shall award the Contract to the Bidder whose bid has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Documents, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

**40. Notification of Award**

40.1 Prior to the expiration of the period of bid validity, the Employer shall notify the successful Bidder, in writing, that its bid has been accepted. The notification letter (hereinafter and in the Conditions of Contract and Contract Forms called the "Letter of Acceptance") shall specify the sum that the Employer will pay the Contractor in consideration of the execution and completion of the Works (hereinafter and in the Conditions of Contract and Contract Forms called "the Contract Price") and the requirement for the Contractor to remedy any defects therein. At the same time, the Employer shall also notify all other Bidders of the results of the bidding.

40.2 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

40.3 The Employer shall promptly respond in writing to any unsuccessful Bidder who, after notification of award in accordance with ITB 40.1, requests in writing the grounds on which its bid was not selected.

**41. Signing of Contract**

41.1 Promptly upon notification, the Employer shall send the successful Bidder the Contract Agreement.

41.2 In case the agreement is sent, within twenty-eight (28) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

41.3 A standstill period of at least 10 calendar days will apply and the contract shall not be signed until the expiry of the

specified standstill period from the date on which the contract award decision is issued to the tenderers

#### **42. Performance Security**

- 42.1 Within twenty-eight (28) days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the General Conditions of Contract, subject to ITB 35.5, using for that purpose the Performance Security Form included in Section X Contract Forms, or another form acceptable to the Employer. If the performance security furnished by the successful Bidder is in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Bidder to be acceptable to the Employer. A foreign institution providing a bond shall have a correspondent financial institution located in the Employer's Country. **(as specified in BDS)**
- 42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security or execution of the Bid-Securing Declaration. In that event the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)****BID DOCUMENTS****FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project

**Tender No. P1Misc-32/2024****PART 1: BIDDING PROCEDURE****SECTION II: BID DATA SHEET****Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-

411005. Tel- 020-7410004067/68

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Section II. Bid Data Sheet****A. General**

<b>General</b>	<p>The following terms are used in the Bidding Documents shall have the same meaning and interpretations:</p> <ul style="list-style-type: none"> <li>• 'Tender(s)' and 'Bid(s)'</li> <li>• 'Tenderer(s)' and 'Bidder(s)'</li> <li>• 'Employer's Requirements' and 'Work Requirements'</li> </ul>
<b>ITB 1.1</b>	<p><b><u>Name of Project:- Pune Metro Rail Project.</u></b></p> <p><b><u>Name of work:-</u></b> Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair &amp; maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture &amp; Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.</p>
<b>ITB 1.1</b>	The Employer is: <b><u>Maharashtra Metro Rail Corporation Limited (Maha-Metro)</u></b>
<b>ITB 1.1</b>	<p>National Competitive Bid (NCB)</p> <p>The number of the Invitation for Bids (Tender No) is: Tender No. P1Misc-32/2024</p>
<b>ITB 1.1</b>	<p>The detailed Scope of Work under this contract is described in detail in the Part II: Section-VII (Works Requirements) of the bid document and other documents. The Contractor has to execute the work accordingly with the approval of Employer.</p> <p>The successful Bidder has to establish its Office at Pune, if it does not have at present.</p> <p>The cost and expenses for setting up the said office(s) will be deemed to have been included in the Quoted Contract Price by the bidder and no separate / extra / additional amount is payable by Employer</p>
<b>ITB 2.1</b>	<p><b>Source of Fund for the project: Source of Fund for the project:</b> Funded by Equity of Government of India (GOI) and Government of Maharashtra (GOM)</p>
<b>ITB 4.1</b>	<p>The bidder may be a firm as a Single Entity</p> <p>Or</p> <p>A joint venture / Consortium</p> <p>Maximum number of members in the JV / Consortium shall be: <b>03 (Three)</b></p> <p>Lead member should not have less than <b>51%</b> participation and other members shall have minimum <b>20%</b> participation in the proposed JV / Consortium for this work.</p> <p>(a) In case of JV / Consortium, change in constitution or percentage participation of JV/Consortium shall not be permitted at any stage after their submission of Bid and thereafter.</p>

	<p>(b) The authorized representative from lead member of JV/Consortium shall be signatory of the bid. (Ref. Section-IV of Part-1)</p> <p>(c) Existing JV/Consortium already worked / working in any department &amp; meeting the eligibility criteria mentioned in <b>Section-III of Bid Document</b>, can bid with the same JV configuration as a Single Entity</p>
<b>ITB 4.2</b>	<p><b>(In Continuation to the existing clause, further added as under)</b></p> <p>(i) No Bidder can be a subcontractor while submitting a Bid individually in his own name or as a partner of a JV / Consortium in the same bidding process. A Bidder, if proposed as a subcontractor in any Bid, may be a proposed subcontractor in more than one Bid also, but only in the capacity of Sub-contractor.</p> <p>(a) A JV/Consortium member will not be permitted to participate in the bid as a single entity.</p> <p>(b) No individual member will be member of JV/Consortium of more than one group of bidder.</p>
<b>ITB 4.6</b>	<p>This Bidding Process is in <b>single stage two-packet system through e-tender portal</b> &amp; open to all eligible bidders as per <b>Evaluation &amp; Qualification Criteria</b> under <b>Section-III</b> of this Bid Document.</p>
<b>ITB 4.7 (Additional Para)</b>	<p>The bidders or any member of JV/ Consortium must not have been <b>blacklisted / debarred</b>, which is in force on the last date of Submission of the Bid,</p> <p>A. for the reasons like supply of sub-standard material, non-supply of material, abandonment of works, sub-standard quality of works, failure to abide "Bid Securing Declaration" etc. by:</p> <p>a. any Department / PSU / Subordinate Offices under Ministry of Housing and Urban Affairs (MOHUA) or</p> <p>b. any department of Government of Maharashtra</p> <p>or</p> <p>B. By Department of Expenditure (DOE), Ministry of Finance, Government of India from participating in any government bidding procedure.</p> <p>Simultaneously the bidder or any of its member of JV/Consortium should not be listed in exclusion list of word bank (Ref. Section-V Cl. No 2 (vii)). The Bidder should submit undertaking to this effect.</p>
<b>ITB 4.8 (Additional Para)</b>	<p>In case, the Bidder is a consortium / JV, a detailed Consortium Agreement between the Members of such Consortium stating clearly their interrelationship and division of work and obligations among the Members as mentioned in <a href="#">ITB 4.13</a> below should be submitted along with the Bid for proper examination by MAHA-METRO. The format of the Consortium Agreement is provided in <a href="#">Section IV: Bidding Form</a>.</p>
<b>ITB 4.9 (Additional Para)</b>	<p>Further, a Power of Attorney signed by all the JV/ Consortium Members duly supported by their board resolutions or statement of joint decision signed by directors must also accompany the Bid authorizing the Lead Member, inter alia, to submit the Bid on their behalf.</p>
<b>ITB 4.10 (Additional Para)</b>	<p>(a) Every Bidder, be it a single entity or a JV/ Consortium, is required to submit along with its Bid, a <b>Power of Attorney</b> duly signed and stamped and supported by its board resolution / Directors authorizing an</p>

	<p>individual as its authorized signatory, inter alia, to sign and submit the Bid. The formats of the Power of Attorney as well as the board resolution are provided in Section IV: Bidding Form. In case of JV/Consortium, such power of attorney and board resolution must be executed and passed respectively by the Lead Member.</p> <p>(b) The Lead member shall be authorized to incur liabilities, receive payment (if provided for in MoU / Consortium Agreement) and receive instructions for and on behalf of any or all Members of the Consortium / Joint Venture.</p> <p>(c) All members of the Consortium / Joint Venture shall be jointly and severally responsible for the execution of the Contract in accordance with the terms and conditions of the Contract.</p> <p>(d) In case of the Bidder being Successful, the JV / Consortium Agreement shall be registered at any place in India so as to be legally valid and binding on all partners / members.</p> <p>(e) The Bid shall be signed so as to be legally binding on all the Members of the Consortium.</p> <p>(f) If the bidding entity is a Proprietorship firm, the proprietor of the firm shall submit a declaration notarized by Notary Public stating that he is the legal owner of the bidding firm &amp; authorized signatory all document. Such declaration shall accompany with PAN Card of proprietor.</p> <p>(g) If the bidding entity is a Partnership firm / Private Limited Company, all the partners shall jointly provide a Power of Attorney in the name of one partner as an authorized signatory. Such declaration shall accompany with copy of DIN numbers of all partners.</p>
<b>ITB 4.11 (Additional Para)</b>	<p>The mode of execution of the power of attorney should be in accordance with the procedure, if any laid down by the applicable law and the charter documents of the executant(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure in the prescribed format as provided in <b>Section IV</b>.</p> <p>For a Power of Attorney executed and issued overseas, the document will also have to be endorsed by the <b>Indian Embassy</b> or notarized/ registered with appropriate statutory authority in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by a Bidder from a country which has signed the <b>Hague Legislation Convention, 1961</b> is not required to be endorsed by the <b>Indian Embassy</b> if it, carries a conforming <b>Apostille</b> certificate. This power of attorney should be registered at appropriate authority and easily verifiable.</p>
<b>ITB 4.12 (Additional Para)</b>	<p>If the Bidder is a Consortium or Joint Venture, the Bidder shall essentially submit the following information in addition to other requirement detailed in Section-III: Evaluation &amp; Qualification Criteria..</p> <p>(a) A Memorandum of Understanding / Consortium Agreement / JV Agreement duly notarized by the notary public of country of origin and should be stamped by Embassy / High Commission (in case of overseas bidder). Bidders from Member Countries of Hague convention may submit all these documents with "Apostille" stamp instead of Embassy.</p>



	<p>(b) Nomination of one of the Members of the Consortium or Joint Venture to be in-charge ("Lead member"); and this authorization shall be covered in the Power of Attorney signed by the legally authorized signatories of all Members of Consortium or Joint Venture.</p> <p>(c) Details of the intended financial participation by each member shall be furnished with complete details of the proposed division of responsibilities and relationships among the individual Members.</p>
<b>ITB 4.13 (Additional Para)</b>	The Bidder shall submit with the Bid full details of its ownership and control or, if the Bidder is a Consortium, full details of ownership and control of each Member thereof. The required information should be submitted as per Form in the Section IV: Bidding Forms.
<b>ITB 4.14 (Additional Para)</b>	<p>Indian Bidders, or Indian Members of a JV/ Consortium shall submit, a copy of the Permanent Account Number (PAN) issued by the Income Tax Authorities and a certified copy of the last 3 years (including the latest Financial Year) income tax return, duly acknowledged by Income Tax department with their Bid and the Technical Package. In case the Indian member of a JV/ Consortium is a wholly owned 100% subsidiary of their foreign partner in the said Consortium and this Indian company has been formed less than 3 years ago, the certified copy of the latest Financial Year income tax return (applicable only if company was formed more than a year ago), duly acknowledged by Income Tax department shall be submitted in the Technical Package.</p> <p>The Indian bidders shall submit copy of GST registration Certificate along with the bid.</p> <p>The foreign partner of the JV/ Consortium shall submit appropriate documents pertaining to their financial capability/ audited balance sheets and clearances of taxes as per the relevant law of the country of their origin.</p>
<b>ITB 4.15 (Additional Para)</b>	Each Bidder (each Member in the case of a JV/Consortium) is required to confirm and declare with its Bid 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. Such Bidder or Member will have to further confirm and declare in the Bid that no agency commission or any payment which may be construed as an agency commission has been, or will be, paid and that the Contract Price will not include any such amount. If the Employer subsequently finds to the contrary, the Employer reserves the right to declare the Bidder as non-compliant, and declare any Contract if already awarded to the Bidder to be null and void. Specific declaration to this effect exactly as per Section IV: Bidding Form shall be submitted with the Technical Package.
<b>ITB 4.16 (Additional Para)</b>	Canvassing or offer of an advantage or any other inducement by any person with a view to influencing acceptance of a Bid will be an offence under laws of India. Such action will result in the rejection of the Bid, in addition to other punitive measures.
<b>ITB 4.17 (Additional Para)</b>	In case, the Bidder is a consortium / JV, a detailed Consortium Agreement between the Members of such Consortium stating clearly their inter-relationship and division of work and obligations among the Members as mentioned in ITB 4.13 below should be submitted along with the Bid for proper examination by

	MAHA-METRO. The format of the Consortium Agreement is provided in Section IV: Bidding Form.
<b>ITB 4.17.1(Additional Para)</b>	Provisions & guidelines of MAKE IN INDIA POLICY 2017 (latest Revision, till final date of submission of Bid), shall be applicable in this bid. The relevant Circulars / office Memorandum attached as an Annexure-II-A of BDS, Section-II.
<b>ITB 4.18 (Additional Para)</b>	Further, a Power of Attorney signed by all the JV/ Consortium Members duly supported by their board resolutions or statement of joint decision signed by directors must also accompany the Bid authorizing the Lead Member, inter alia, to submit the Bid on their behalf. The formats of the Power of Attorney as well as the board resolution are provided in Section IV: Bidding Form. All the relevant forms should be duly signed and be submitted as per the requirements of the forms.
<b>ITB 4.18 .1 (Additional Para)</b>	Restriction under Rule 144(xi) of General Finance Rule (GFR), 2017 As per Govt. Of India Order (Public Procurement No.1) bearing no. F.No.6/18/20-19-PPD, Dt. 23.07.2020 Restrictions on Bidding has been imposed on bidders from the country of origin which shares land boundary with India. Relevant Clauses is attached as an Annexure-II-B of BDS, Section-II, which is applicable to this bid without any change.
<b>ITB 4.19</b>	Additional grounds for exclusion shall be applicable as per Annexure-II D
<b>B. Bidding Documents</b>	
<b>ITB 6.7 (Additional Para)</b>	<b>Supporting Documents / Information.</b>  (a) The reference documents, reports, drawings containing site information included in the Bidding Documents are for general information only and any interpretation of the results shall be construed as opinions only and not as representations or warranties as to the actual site conditions. The Bidders' attention is specifically drawn to ITB 6.7 (b) below.  (b) The Bidders shall note the existence of over ground, at grade and underground structures, utilities and infrastructure in the near vicinity of the Works to be constructed.  (c) The accuracy or reliability of the documents and reports referred to in this Para ITB 6.7 and of any other information supplied, prepared or commissioned at any time by the Employer or others in connection with the Contract is not warranted. The Bidders' attention is drawn to Clause 4.10 of GC / S.No. 11 of PC in this regard. The Bidder should visit, examine and assess the Site including working conditions and will be deemed to have satisfied himself of the risks and obligations under the Contract.
<b>ITB 7.1</b>	(a) For <b><u>clarification purposes</u></b> only, the Employer's address is: <b>Executive Director (Procurement &amp; Contracts)</b> MAHARASHTRA METRO RAIL CORPORATION LIMITED Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005., Maharashtra, INDIA

	<p>Electronic mail address: <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a></p> <p>Web page: <a href="http://www.punemetrorail.org">www.punemetrorail.org</a></p> <p>All correspondence from MAHA-METRO pertaining to this Bid till award of the work shall be done by the authorized representative of MAHA-METRO. The Bidders are advised to regularly check their email ID registered with their user account at e-tendering portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> for any update/ addendum/ corrigendum/ pre-bid and post-bid queries/ any other correspondence by the Employer.</p> <p>(b) MAHA-METRO shall endeavor to respond to the questions raised or clarifications sought by the Bidders by uploading the same in the form of corrigendum/ clarification in the e-tender portal within the time and date specified in the NIT. MAHA-METRO will not respond and reply to each of the bidders separately.</p> <p>(c) MAHA-METRO may also on its own, if deemed necessary, issue interpretations and clarifications to all Bidders in the form of Addendum and the same shall be uploaded on e-tender portal. All clarifications and interpretations issued by MAHA-METRO shall be deemed to be part of the Bid Documents. Verbal clarifications and information given by MAHA-METRO or its employees or representatives shall not in any way or manner be binding on MAHA-METRO</p>
<b>ITB 7.4</b>	<p>A Pre-Bid meeting shall take place at the following date, time and place: Date &amp; Time: <b>As per NIT.</b> <b>Place:-</b> <b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b> Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005., Maharashtra, INDIA</p>
<b>ITB 7.5</b>	<p>The Bidder is requested, as far as possible, to submit any questions in writing, to reach the Employer before the date and time specified for Pre-Bid meeting in NIT &amp; ITB 7.4 above. The bidder may send such queries either by post to the address mentioned in the bid document or send by mail to <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a></p>
<b>ITB 7.6</b>	<p>Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by Bidders, without identifying the source, and the responses given, together with any responses prepared after the meeting, will be uploaded on the E-Tender portal in accordance with ITB 6.3, and the same shall also be part and parcel of the Bid Document.</p>
<b>ITB 8.2</b>	<p><b>Following is added to the existing clause of ITB 8.2</b></p> <p>Such modification in the form of an addendum / Corrigendum will be uploaded on the e-tendering portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> within the date given in NIT, which shall be available for all the prospective Bidders.</p> <p>Without prejudice to the general order of precedence prescribed in the Clause 1.5 of GC, bidder shall ensure these documents should be submitted along with their original Bid documents submission. All these addendums, corrigendum and clarifications shall be part of the Contract.</p>

### C. Preparation of Bids

<b>ITB 10.1</b>	The language of the bid is: <b>English</b>
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	<p>All correspondence/ exchange shall be in the <b>English language</b>. Language for translation of supporting documents and printed literature is <b>English</b>.</p> <p>Supporting documents related to eligibility criteria enclosed with the bid, other than English Language, should be translated in to <b>English</b> and will have to be endorsed by the <b>Indian Embassy</b> or notarized/ registered with appropriate statutory authority in the jurisdiction where the supporting document is being issued.</p> <p>However, such documents provided by a Bidder from a country which has signed the <b>Hague Legislation Convention 1961</b> is not required to be endorsed by the <b>Indian Embassy</b>, if it carries a conforming <b>Apostille Certificate</b>.</p> <p>The bidder should provide the relevant contact number &amp; E-Mail ID along with the postal address, in <b>English</b>, of issuing authority / agency of such documents for verification purpose.</p>
<b>ITB 11</b>	<b>Documents Comprising the Bid</b>
<b>ITB. 11.1 (c)</b>	<b>Only Bid Security / EMD shall be acceptable as detailed in NIT &amp; ITB 19.1</b>
<b>ITB. 11.1 (d)</b>	Alternative bid is <b>not permissible</b> .
<b>ITB. 11.1 (j)</b>	<p>The Bidder shall, on or before the date and time given in the Notice of Invitation (NIT) to Bid, upload his Bid on e-tendering portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> in accordance with provisions in ITB 22.1.</p> <ul style="list-style-type: none"> <li>i. The Bidder shall follow the procedure and steps of E-Tender portal given in <b>E-Tender Toolkit</b> provided as <b>Annexure-II-C</b></li> <li>ii. <b>Cost of the bid:</b> Paid online through E-Tender portal.</li> <li>iii. <b>Bid Security:</b> Evidence of submission / payment of Bid Security as per provision of NIT and BDS ITB 19.1 to be submitted.</li> <li>iv. <b>Technical Package:</b> To be submitted at appropriate place i.e. Technical Envelope on e-tender portal.</li> <li>v. <b>Financial Package:</b> Financial bid form to be duly filled up directly in the Commercial Envelope only on e-tender portal and not anywhere else.</li> <li>vi. <b>Bidder should ensure that the no part of the Financial Bid should be up- loaded anywhere in the technical envelope, if the bidder does so then his bid will be rejected out-rightly.</b></li> <li>vii. The original Bank Guarantee towards <b>Bid Security (if any)</b>, shall be submitted within <b>(07) Seven</b> working days from the last date stipulated for submission of bid at the office of MAHA-METRO at address given at ITB 7.1 above.</li> </ul>

<b>ITB 11.1 (k)</b>	The bid documents shall include all the corrigendum/ addendum/ clarifications provided by the Employer during the course and before submission of Bid along with all necessary essential enclosures as specified in the bid document. In case of failure by the bidder in uploading (submission) the same, the bid shall be treated as non-responsive and not evaluated further.
<b>ITB 11.3</b>	<b>As per Letter of bid in Section IV. - Payment of Commission &amp; Gratuities not permitted.</b>
<b>ITB 13.1</b>	Alternative bids shall <b>not be permitted</b> under ITB 13.2, ITB 13.3, or ITB 13.4
<b>ITB 13.2</b>	Alternative times for completion not permitted.
<b>ITB 13.3</b>	Not Applicable.
<b>ITB 13.4</b>	Alternative technical solutions shall not be permitted.
<b>ITB 14.1</b>	<p>The Price is to be quoted Online on E-Tender Portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> &amp; Letter of discount, if any, shall be uploaded in <b>Financial Bid Section of E-Tender Portal</b> only.</p> <p>No discounts offer are allowed to be quoted by the bidder in the <b>Letter of Bid</b> and No discount letter to be uploaded in <b>Technical Bid Section of E-Tender Portal</b>.</p> <p>Offering Discount in any form in Technical Section of E-Tender Portal or in Letter of Bid, shall lead to disqualification of Bidder and Financial Bid of such bidder shall not be taken in consideration for evaluation.</p>
<b>ITB 14.2</b>	The bidder shall quote the price online in the <b>Financial Bid Section of the E-Tender portal</b> <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> , either rate against each item or in the summary sheet of schedule of BOQ or scanned & upload the filled BOQ/Schedule or Lump sum Price (as the case may be) as per provision described in the aforesaid Financial Bid Section of Bid Document.
<b>ITB 14.3</b>	The price quoted in the Financial Bid Section of E-tender portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> shall be the total price of the bid.
<b>ITB 14.4</b>	<p>Any disclosure of Financial Offer and any offering of any Discount thereon in Technical Bid is not permitted.</p> <p>Discount, if any, shall be submitted by bidder in Financial Bid Section of E-Tender Portal only</p>
<b>ITB 14.5</b>	For price adjustment / variation, refer to instructions / conditions provided in the Section VIII- GC read with Section IX-Particular Conditions of Contract.
<b>ITB 14.6</b>	Not Applicable
<b>ITB 14.7</b>	<ol style="list-style-type: none"> <li>Price quoted by the bidder includes GST &amp; all other applicable Taxes, Duties, Levies payables etc. complete,</li> <li>All taxes, duties, levies prior to Base date i.e. 28 days prior to latest date of submission of Bid is deemed to be inclusive in the price quoted by Bidder.</li> <li>Any change in legislation of any kind of Taxes by GOI or GOM, after Base Date shall be accounted separately and shall be applicable both ways (Reimbursement &amp; Deduction).</li> </ol>

	iv. Successful bidder has to pay the applicable stamp duty towards the registration of Contract Agreement, as per prevailing norms /act of Govt of Maharashtra.
<b>ITB 14.8 (Additional Para)</b>	Bidders shall quote for the entire work on a “single responsibility” basis such that the Bid Price covers all Contractor’s obligations mentioned in or to be reasonably inferred from the Bid Documents in respect to this works and completion of the whole of Works. This includes all requirements under the Contractor’s responsibilities for testing and commissioning of the works executed including integrated testing and commissioning, the acquisition of all permits, approvals and tender licenses, etc.; the operation, maintenance and such other items and services as may be specified in the Bid Documents.
<b>ITB 14.9 (Additional Para)</b>	The Employer may get, from the Government, partial or complete waiver of taxes, royalties, duties, Labour, cess, octroi, and other levies payable to various authorities. The successful Bidder (the Contractor) shall maintain meticulous records of all the taxes and duties paid and provide the same with each running bill. In case the waiver becomes effective, the Contractor will be advised on the process to be followed to obtain the refund from the concerned authority. The Contractor shall arrange for the remit of the refund to the Employer. In case of failure by the Contractor to remit such amounts, the same shall be recovered from amounts due for payment to the Contractor. The Pro forma of undertaking is provided in Section IV: Bidding Form.(Form-7)
<b>ITB 14.10 (Additional Para)</b>	With the Bid submission, the Bidder shall submit the Pro forma of undertaking provided in Section IV: Bidding Form stating that registrations under various fiscal and labour laws like GST, Central Excise, Import Export Code, Employee State Insurance, Provident Fund, Maharashtra Labour Welfare Fund, Local Body Tax shall be obtained by the bidders in the event of award of the work. (Form-32)
<b>ITB 14.11 (Additional Para)</b>	MAHA-METRO project is covered under Project Import chapter 98.01 of Custom Tariff Act according to which only concessional custom duty is payable. The Bidder should avail this benefit and pass on the benefit of the same to MAHA-METRO.  As regards registration under Project Import, after the award of the contract, MAHA-METRO at the written request of Contractor shall facilitate the Contractor for obtaining sponsoring / recommendation letter from the Ministry of Urban Development / Government of Maharashtra for getting themselves registered for availing Project Import benefits. The responsibility to avail the concessional benefits under Project Import shall solely rest with the Contractor.
<b>ITB 15.1</b>	The currency of the Bid & payment shall be <b>Indian Rupees (INR)</b> only.
<b>ITB 17.2</b>	Provisions and norms as stipulated in “Make in India Policy 2017” issued by GOI with the latest amendment till the time of submission of the bid, shall be applicable in this Tender.
<b>ITB 17.3</b>	Applicable if the bid is two stage i.e., Pre-Qualification Stage & Bidding Stage
<b>ITB 18.1</b>	The bid validity period shall be <b>180 (One Hundred &amp; Eighty) days</b> .

<b>ITB 18.3 (a)</b>	The bid price shall not be adjusted in event of delay of award.
<b>ITB 19.1</b>	<p>(a) A Bid Security is required as specified in NIT:</p> <p>(b) Bid security shall be in form of Unconditional guarantee issued by any Nationalized or Scheduled Commercial Bank (Except Co-Operative Bank) of Indian origin or Scheduled commercial foreign bank having business office in India. The Bid Security Bank Guarantee shall be as per Form in Section-IV: Bidding Forms.</p> <p>Or</p> <p>In the form of Bid Securing Declaration, as per format provided in Section –IV of Bid Document (If applicable, as specified in ITB 19.2 below)</p> <p>(c) A scanned copy of this BG is to be uploaded online and the Bidder should ensure physical submission of the original bank guarantee at the office of MAHA-METRO at address specified in Bidding Documents, within <b>7 (Seven) working days</b> from the time and last date scheduled for handing over the Bidding Documents (online).</p> <p>(d) If the Bidder fails to submit the scanned copy at the aforesaid (c. above) or fails to submit the original bank guarantee (c. above) , his bid shall not be considered for opening/evaluation &amp; shall be rejected outright.</p> <p><b><u>Bankers Detail of Employer (MAHA-METRO) for issuance of Bank Guarantee as Bid Security as per Structured Finance Messaging System (SFMS).</u></b></p> <p style="text-align: center;"><b>Name of Beneficiary: MMRCL- PUNE-TENDER FEES AND EMD</b></p> <p style="text-align: center;"><b>Bank Name: HDFC Bank, Shankarsheth Road Branch, Pune</b></p> <p style="text-align: center;"><b>Account No: 50200068854177</b></p> <p style="text-align: center;"><b>IFSC Code: HDFC0000104</b></p> <p><b><u>Note: -</u></b></p> <p>This account is for issuance of Bank Guarantee through Bidder's Bank in Electronic format (SFMS).</p> <p>(e) The EMD / Bid Security received in the form of Bank Guarantee shall be scrutinized in accordance with the Format provided in Section-IV of Bid Document and its authenticity shall also be verified from the issuing bank.</p> <p>(f) Any material or cognizable changes in format of Bid Security Bank Guarantee (Provided in Section-IV), which leads to affect the interest of Maha-Metro adversely, shall not be accepted. In such case Maha-Metro reserves the right to reject the EMD/Bid Security &amp; disqualify the bid.</p> <p>(g) <b>The cash component of Bid Security (if any) shall be paid through the provision made on E-Tender portal itself via RTGS/ NEFT/ Credit Card (Not applicable in this tender).</b></p>

<b>ITB 19.2</b>	<b>As per GFR-2017, Rule No. 171, Bid Security / EMD is exempted for participating bidder registered as MSE (Micro or Small).</b> If applicable, the bidder shall submit <b>“Bid Securing Declaration”</b> as per <b>Format-34, Section-IV</b>
<b>ITB 19.3</b>	The Bidder shall submit with his Bid, a Bid Security for the sum mentioned in NIT in the form as specified in NIT and ITB 19.1 above.
<b>ITB 19.4</b>	EMD /Bid Security shall be as per ITB 19.1 & NIT
<b>ITB 19.5</b>	The bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's acceptance of Letter of Acceptance (LOA) issued by MAHA-Metro.
<b>ITB 19.8</b>	The bid security or a Bid Securing Declaration (if applicable, Ref.19.2), as specified in Section-II BDS, CI No. 19.1 can be submitted by JV/Consortium or lead member only on behalf of the JV/Consortium.
<b>ITB 19.9</b>	Bid Security is required in this bid.
<b>ITB 20.1</b>	<b>Replacement for ITB as under:</b> Bid to be submitted through E-Tender portal only.
<b>ITB 20.2</b>	<b>Replacement for ITB as under:</b> The Bid shall be submitted by bidder, online through e-tender portal . Details has been described at <b>ITB clause no. 21 &amp; Annexure-II-C</b> The written confirmation of authorization to sign on behalf of the Bidder shall consist of: <ul style="list-style-type: none"> <li>i. In case of bidder is a Proprietorship Firm, the proprietor shall be authorized signatory of bid and a notarized Undertaking shall be submitted by bidder as per Format provided in Section-IV : Bidding Forms</li> <li>ii. A notarized Power Of Attorney authorizing a signatory, supported by board resolution in case of single bidder (i.e. Limited Company, Private Limited Company , LLP company)</li> <li>iii. A notarized Power of Attorney, authorizing the Lead Member as a signatories of the Bid on behalf of JV/Consortium. This authorization of Lead Member shall be signed by authorized signatories (POA) of each member of the JV/Consortium supported by copy of POA and board resolution of respective JV/Consortium Member Company. The power of attorney (ies) shall be substantially in the format provided under Section IV: Bidding Forms of these Bidding Documents.</li> <li>iv. The online bid shall be submitted by using Digital Signature Certificate (DSC) of authorized POA of bidder detailed at (i),(ii) &amp; (iii) above.</li> </ul>



<b>ITB 20.3</b>	<p><b>i. In case of JV / Consortium the power of attorney holder of lead member is authorized to sign all legal documents, bid documents and other enclosures.</b></p> <p>ii. A notarized Power of Attorney, authorizing the Lead Member as a signatories of the Bid on behalf of JV/Consortium. This authorization of Lead Member shall be signed by authorized signatories (POA) of each member of the JV/Consortium supported by copy of POA and board resolution of respective JV/Consortium Member Company. The power of attorney (ies) shall be substantially in the format provided under Section IV: Bidding Forms of these Bidding Documents.</p> <p>iii. The formats of the Power of Attorney as well as the board resolution are provided in Section IV: Bidding Form. All the relevant forms should be duly signed and be submitted as per the requirements of the forms</p> <p><b>iv. The facility on the E-tender portal is also available for viewing &amp; downloading the document free of cost.</b></p>
<b>ITB 21.1, 21.2 &amp; 21.3</b>	<p>The Bidder shall submit/ upload (through digital signature of authorized person in e-tender portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a> (as described in ITB 20) in the Technical Package of its Bid the following documents, duly completed, which in the event of acceptance of the Bid, shall form part of the Contract: -</p> <p>i. Physical Sign &amp; seal of bidder on each page of Bid Documents available online is not required.</p> <p>ii. Copy of Power of Attorney signing the bid of bidder or of Lead member in case of JV / Consortium.</p> <p>iii. Scanned copy of Bid Security: Cash, (if any) as well as BG component refer E-tender Notice).</p> <p>iv. Scanned copy of POA of each member &amp; Lead member in case of JV/ Consortium.</p> <p>v. All relevant formats given in Section IV: Bidding format. Physically Signed by authorized signatory / POA of bidders or Lead member in case of JV/ Consortium.</p> <p>vi. Certificate of registration and other statutory documents of formation of bidder's company or JV/ Consortium or each members of JV/ Consortium (If not incorporated yet) issued by appropriate authority.</p> <p>vii. Copy of PAN card of bidder. (PAN card of Indian member of JV/Consortium, if JV/Consortium consist foreign member).</p> <p>viii. Copy of all financial documents as directed in Section-III.</p>

	<p>ix. Relevant work experience certificate (in line of Section III: Evaluation and Qualification Criteria) and other qualifications certificates as given in Evaluation of Qualification under Section III.</p> <p>x. All Format of Section-IV and other enclosure, certificates stated above or desired elsewhere in the bid documents shall be physically filled, signed &amp; stamped by authorized signatory / POA of bidder or POA of Lead member of JV/Consortium and scanned copies of such enclosures/documents should be uploaded on e-tender portal <b><a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a></b> along with bid-documents.</p> <p>The enclosures meant for Technical Bid shall be uploaded with Technical Envelope &amp; Financial enclosures (If any) shall be uploaded with Commercial Envelope on E-Tender Portal of only.</p>
<b>ITB 21.4 (Additional Para)</b>	Financial Bid (Commercial Envelope)
<b>ITB 21.4.1 (Additional Para)</b>	<ol style="list-style-type: none"> <li>1. The financial bid shall be submitted in financial envelope/commercial envelope.</li> <li>2. BOQ/Summary sheet provided in the Commercial Envelope/financial envelope Section of E-Tender portal <b><a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a></b> shall be duly filled up online by bidder.</li> <li>3. Few price schedules may require to be filled up physically and required to be signed &amp; stamped by authorized signatory / POA of bidder or POA of Lead member of JV/Consortium and a scanned copy of such schedules may be uploaded, as per instructions provided in the BOQ or E-Tender Portal.</li> <li>4. The Total Bid Price includes GST and other Taxes, Duties, Levies, Royalties (if not provided specifically) also. The price to be quoted shall be the total price of the Bid as elaborated in Part 4 Financial Bid &amp; Bill of Quantities. Bidders are advised to examine the BOQ in details regarding the above.</li> </ol>
<b>ITB 22</b>	<p>Last date and time of submission of online Bid shall be as per NIT or subsequent revision through corrigendum/addendum.</p> <p>Procedure of submission of bid electronically i.e. E-tender has been described in <b>Annexure-II-C</b> of bid document.</p>
<b>ITB 23</b>	The submission of bid is permitted through E-Tender portal only. Submission of bid is not possible beyond the permitted date and time of submission of bid.
<b>ITB 24.1, 24.2 &amp; 24.3</b>	<ol style="list-style-type: none"> <li>i. As the bid process is through e-tendering portal of MAHA-METRO, amendment/ modification of bid by using the Re-Work option of the E-Tender portal shall be permissible before closing of the bidding process i.e. last date and time of submission of bid.</li> <li>ii. In case the bidder desires to withdraw the already uploaded/submitted bid, the same would not be possible but the bidder can opt not to proceed with the submission of the bid after opting "Re-work" option on E-tender</li> </ol>

	<p>portal. This can be done only prior to closing date and time of bidding process.</p> <p>iii. The bidder should further note that in such case of not proceeding with submission of bid, the Bid Security, if paid online, through the E-Tender portal, the same will not be refunded immediately. Such cases shall be dealt separately offline after completion of bidding process.</p>
<b>ITB 25.1</b>	<p>The bid opening/ shall take place at office of:  <b>Executive Director (Procurement)</b>  <b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>  <b>Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005, Maharashtra, INDIA</b>  <b>Date: As per NIT</b>  <b>Time: As per NIT</b></p> <p>The electronic bid (E-tender) opening procedure shall be as under:  <u><b>The Technical Envelope/ Packages of Online Submitted Bids shall be opened/ downloaded by the opening committee on due date and time of Bid opening.</b></u></p> <p>No minimum number of bids is required in order to proceed to bid opening.</p> <p><b>In addition to the provisions of ITB 25.1, following shall apply:</b></p> <ol style="list-style-type: none"> <li>The Bid Security will be checked and details will be read out for the information of representative of Bidders, present at the time of opening of Bid.  Technical Envelope/ Package of those Bidders who have not submitted Bid Security shall not be opened. Bid which is accompanied by an unacceptable or fraudulent Bid Security shall be considered as non – compliant and rejected. <b>Also, bidders who have not uploaded the essential enclosures and formats and not agree the Bid document, Corrigendum, Addendum as uploaded on the E-Tender portal, their submission treated as non-responsive and no further technical evaluation will be carried out.</b></li> <li><b>The entire submission of the bidder shall be downloaded and examined, scrutinized and evaluated by a committee of officers of MAHA-Metro.</b></li> <li>After evaluation of Technical Bid received electronically via E-Tender portal, the Financial/ Commercial Package/ Envelope of bid of the bidders who have been evaluated as substantially responsive shall be opened. The date &amp; time of opening of Financial Bid shall be communicated to Technically Successful bidder electronically (E-mail).</li> </ol>
<b>ITB 25.2</b>	<p>Cases of “Withdrawal of Bid” and “Modification of Bid” has been described and clarified in clause ITB 24 above.</p>
<b>ITB 25.3</b>	<p>The Bid received through E-tender portal shall be opened in two stages i.e. Technical Bid opening and Financial Bid opening. The entire opening</p>

	process shall be done online on E-Tender portal. If bidder desires, the opening of bids may be witnessed by their authorized representatives.
<b>ITB 25.4</b>	<p><b>Replace provisions of ITB 25.4 with the following:</b></p> <p>The opening of Bid shall be done online on E-Tender portal . The employer shall open the Bid using DSC (Digital Signature Certificate) of authorized officers of MAHA-Metro. The opening log of Bid shall be generated automatically on E-Tender Portal and the printout of the same shall be retained in the tender file.</p> <p>The Employer shall prepare a record of the bid opening that shall include the name of the Bidder. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record.</p> <p>The entire bid submitted by bidder shall be downloaded &amp; printed for evaluation by a Tender Evaluation Committee.</p>
<b>ITB 25.5 (Additional Para)</b>	<p>After the evaluation of the Technical Bid in accordance with ITB 27, 28, 29 and ITB 30, the Employer shall prepare a list of responsive Bidders for opening of their Financial Bid.</p> <p>The Bidder is advised that the Employer's policy in respect of comparison of Bids is that the Technical Packages will be opened and reviewed to determine their acceptability and responsiveness to the Works Requirements and Bidding Drawings.</p> <p>Unacceptable and unresponsive bids will be rejected, and the corresponding Financial Package will not be opened."</p> <p>The opening of Financial Bid shall be done in presence of respective representatives of responsive Bidders who choose to be present. A date, time and venue will be electronically notified to responsive bidders for announcing the result of evaluation and opening of the financial bid.</p> <p><b>Result of Technical Evaluation shall be communicated electronically to all the bidders.</b></p>
<b>ITB 25.6 (Additional Para)</b>	<p>All Financial Bid shall be opened by using DSC of authorized officer of Maha-Metro and the same shall be downloaded from the online E-Tender portal.</p> <p>The contents of the Financial Bid are to be initialed by bid opening committee of the Employer attending bid opening either in ink or by using DSC.</p> <p>The authorized representative of contractor are permitted to witness the opening process of Financial Bid</p>

#### **E. Evaluation, and Comparison of Bids**

<b>ITB 26.4 (Additional Para)</b>	The Bid drawings and documentation issued for this work is the property of MAHA-METRO (Employer) and shall be used solely for bidding purpose as general guidance. They shall not be used in part or whole or altered form for any other purpose without the permission in writing of the Employer.
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<b>ITB 29.1.1 (Additional Para)</b>	<p><u>Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid:</u></p> <ul style="list-style-type: none"> <li>i. All enclosures, declarations, formats are properly signed by authorized representative of bidder or authorized representative of lead member of a JV/Consortium</li> <li>ii. The complete bid document including all corrigendum/addendum/clarifications issued time to time, prior to the submission of bid should be agreed by bidder and all required enclosures should be uploaded on the e-tender portal through digital signature of bidders or through Digital Signature (DSC) of authorized representative of all members of a JV/Consortium has been accompanied by a valid Bid Security; and meets the Qualification &amp; Evaluation Criteria -</li> <li>iii. Bidders, which do not qualify in any of the minimum eligibility criteria including Bid Capacity criteria and other criteria described in bid document elsewhere, shall not be considered for further evaluation of technical packages and shall be rejected.</li> <li>iv. meets the other aspects of general evaluation as per BDS ITB 4.9 to 4.17</li> <li>v. includes the signed copy of Covenant of Integrity and the Environmental and Social Covenant</li> </ul> <p><b>Absence of the above documents shall result in disqualification of the Bid/Bidder.</b></p>
<b>ITB 29.5 (new Para)</b>	<p>Bidders may note that pursuant to their qualification in the 'Prequalification and Evaluation Criteria' and 'Technical Evaluation' as per ITB clause 29, any acts of the Bidder (applies to each individual member in case of a Joint Venture/Consortium) which constitute sufficient ground for exclusion as mentioned under ITB 4.19 will result in disqualification of the Bidder and the Financial Package of such Bidder shall be returned unopened.</p>
	<b>Replace existing ITB 32 and its sub-Para as under</b>
<b>ITB 32.1</b>	<p>Bids will be compared in <b>Indian National Rupees (INR)</b> only. This will be achieved by conversion of the Foreign Currency if any, of the Bid into Indian Rupees by using the Exchange Rates of Reserve Bank Of India at the close of business of the <b>Reserve Bank of India on 7 days prior to the day of Bid submission</b>, and then adding the same to the Indian Rupee portion (if any) of the Bid. In case this <b>particular</b> day happens to be a holiday, the exchange rate at the closing of the business of the <b>Reserve Bank of India</b> on the previous working day will be considered.</p>
<b>ITB 33.1</b>	<p>Margin of purchase preference shall be applicable as per <b>MAKE IN INDIA POLICY 2017</b> (latest Revision at the time of Submission of Bid). The relevant Circulars / office Memorandum enclosed attached as an <b>Annexure-II A</b> of BDS.</p>
<b>ITB 34.1</b>	No subcontractor is nominated by Employer.
<b>ITB 34.2</b>	Not Applicable
<b>ITB 34.3</b>	Not Applicable
<b>ITB 34.4</b>	<b>Sub-Contract</b>

<b>(Additional Para)</b>	<p>Sub-contracting shall be generally limited to <b>50%</b> of the awarded price of the work excluding the cost of design, if any. The terms and conditions of subcontracts and the payments that have to be made to the Subcontractors shall be the sole responsibility of the Contractor.</p> <p>For sub-contracts exceeding Rs 5 million, it will be obligatory for the Contractor to obtain a <b>"No-Objection"</b> from the Engineer/ Employer. The credentials of the Sub-contractor and Vendor need approval of employer. The Contractor shall certify that the cumulative value of the subcontracts (<b>including those up to Rs. 5 million each</b>) awarded is within the aforesaid <b>50%</b> limit. Any proposals by the Bidders in their offer shall not be construed as an approval of the vendor.</p> <p>The Subcontractor / Vendor shall fully comply with the technical specifications included in the Works Requirements.</p>
<b>ITB 35.2</b>	<p><b>Replace existing ITB 35.2 as below:</b></p> <p>For evaluation of Price Bid, the employer shall consider the price bid submitted by the bidder making corrections for errors, if any, pursuant to ITB 31.2 above <b>only</b>.</p> <p>Price variation clause will not be considered for financial evaluation.</p>
<b>ITB 35.6 (Additional Para)</b>	<p>The Employer reserves the right to accept or reject any variation, deviation or alternative offer. Variations, deviations, alternative offers and other factors which are in excess of the requirements of the Bidding Documents or otherwise result in the accrual of unsolicited benefits to the Employer shall not be taken into account in Bid evaluation.</p>
<b>ITB 35.7 (Additional Para)</b>	<p>The Contractor grants the Employer, the EIB and auditors appointed by either of them, as well as any authority or European Union Institution or body having competence under European Union law, the right to inspect and copy the books and records of the bidder, contractor, supplier or consultant in connection with any EIB-financed contract</p>

#### F. Award of Contract

<b>ITB 39.1</b>	<p><b>Replace the existing ITB 39.1 with the following:</b></p> <p>Subject to ITB 38.1 and ITB 39.2, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding Documents and who has offered the Lowest Evaluated Bid Price, and whose offer is balanced in terms of ITB 35.6, provided that such Bidder has been determined to be eligible and qualified in accordance with provisions of ITB 4.</p>
<b>ITB 39.2 (Additional Para)</b>	<p>In case, Successful Bidder is a JV/ Consortium, then the Performance Security may be furnished on behalf of the JV/ Consortium either by the Lead Member or by all the Members of such JV/ Consortium in such proportion as may be agreed between them as per JV/ Consortium agreement.</p>

<b>ITB 40.4 (Additional Para)</b>	The “Letter of acceptance” will be sent in duplicate to the successful Bidder, who will return one copy to the Employer duly acknowledged and signed by the authorized signatory, within one week of receipt of the same by him. The Letter of Acceptance will constitute a part of the Contract.
<b>ITB 42.1</b>	The Performance Guarantee required in accordance with Clause 4.2 of the GC shall be for an amount as specified in Section IX. Particular Conditions in the form of a bank guarantee issued from a Scheduled commercial bank of India (excluding Cooperative Banks) or from a scheduled Foreign Bank having business office in India as defined in Section 2(e) of RBI Act 1934 read with Second Schedule in the types and proportions of currencies in which the Contract Price is payable.
<b>ITB 42.3 (Additional Para)</b>	The Bidder has to furnish other Guarantees, Undertakings, and Warranties, in accordance with the provisions of the General Conditions of Contract and Particular Conditions of Contract (refer ITB 43).
<b>ITB 43 (Additional Para)</b>	<b>Guarantees and Warranties</b>  The Contractor shall submit other all Warranties, Guarantees & Undertakings (as applicable) in accordance with Clause 26 of PC and Section I ITB and Section X-Contract form.
<b>ITB 44 (Additional Para)</b>	<b>Insurance</b>  The Bidders’ attention is drawn to the provisions contained in Clause 18 of the General Conditions of Contract and Clause 55, 56, 57, 58 and 59 of Particular Conditions of Contract.
<b>ITB 45 (Additional Para)</b>	<b><i>Settlement of Disputes of the Tender Process:</i></b> Any suit or application, arising out of any dispute or differences on account of this Tender shall be filed in District and Sessions court at <u>Pune</u> , Maharashtra, Bombay High Court, Maharashtra/ Supreme Court of India, New Delhi only and no other court or any other district of the country shall have any jurisdiction in the matter.”

**Annexure-II-A**  
**Public Procurement (Preference to Make in India)**



**Annexure-II-B**  
**Public procurement-Rule 144 (xi)**

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**

**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**PART 1: BIDDING PROCEDURE**  
**SECTION II: ANNEXURE II-C: Tool Kit for using E-Tender Portal**



**Maharashtra Metro Rail Corporation Limited**  
Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005.,  
Maharashtra, INDIA. Tel- 020-7410004067/68  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)

## E- TENDERING PROCEDURE

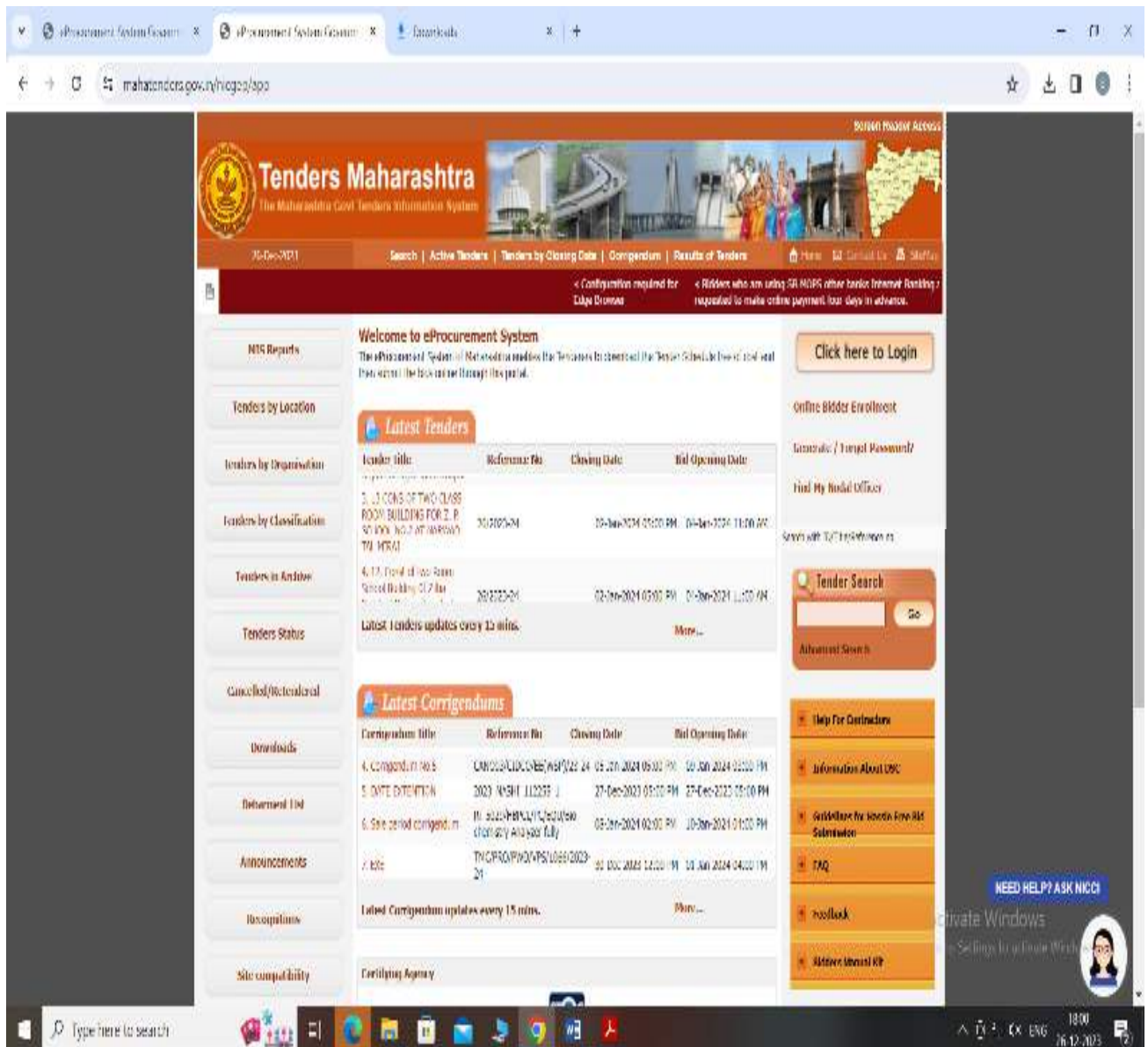
## **Tool Kit for using E-Tender Portal of Maharashtra Government**

**i. The agencies interested to participate in this bid may purchase document online and follow**

**the procedure detailed in Maharashtra Government e-Tendering Portal.**

ii. The detailed procedure can be accessed from the below highlighted tab or follow the link

**i.e. <https://mahatenders.gov.in/nicgep/app?page=BiddersManualKit&service=page> to access the information for detailed procedure.**



**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**  
**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**PART 1: BIDDING PROCEDURE**  
**SECTION II: ANNEXURE II-D: Grounds for**  
**Exclusion:**



**Maharashtra Metro Rail Corporation Limited**  
Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005,  
Maharashtra, INDIA Tel- 020-7410004067/68  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Grounds for Exclusion:**

Bidders (either natural or legal persons including any of their subcontractors) shall not be awarded this contract if, on the date of submission of an application or of a bid or on the date of award of a contract, they have been the subject of a conviction by final judgment for one of the following reasons:

- a) where the Bidder is bankrupt or is the subject of insolvency or winding up proceedings, where its assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under national laws and regulations;
- b) Bidders have not fulfilled their obligations regarding the payment of social security contributions or taxes in accordance with the legal provisions of the country where they are established or the Employer's country;
- c) where the Employer can demonstrate by any appropriate means a violation by the Bidder of applicable obligations in the fields of environmental, social and labour law established by national law, collective agreements or by the international environmental, social and labour law provisions;
- d) where the Employer has sufficiently plausible indications to conclude that the Bidder has entered into agreements with other Bidder(s) aimed at distorting competition;
- e) where the Bidder has shown significant or persistent deficiencies in the performance of a substantive requirement under a prior public contract, a prior contract with the Employer or a prior concession contract which led to early termination of that prior contract, damages or other comparable sanctions;
- f) Bidders have been convicted within the past five years by a court decision, which has the force of residential jurisdiction in the country where the project is implemented, of fraud or corruption or any other Prohibited Conduct (as defined in the Covenant of Integrity) committed during the procurement or performance of a contract, unless they provide supporting information together with their Covenant of Integrity which shows that this conviction is not relevant in the context of this project;
- g) Bidder is listed for financial sanctions by the United Nations and/or the European Union for the purposes of fight against terrorist financing or threat to international peace and security;
- h) Bidder including JV Partners should be excluded by the EU Institutions or any major Multilateral Development Bank (including World Bank Group, African Development Bank, Asian Infrastructure Investment Bank, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank or Inter-American Development Bank) from participation in a tendering procedure on the grounds of Prohibited Conduct;
- i) where the Employer can demonstrate by appropriate means that the Bidder is guilty of grave professional misconduct, which renders its integrity questionable;
- j) where a conflict of interest within the meaning of **Clause 4.2 of ITB** cannot be effectively remedied by other less intrusive measures;
- k) where a distortion of competition from the prior involvement of the Bidder in the

preparation of the procurement procedure, as referred to in **Section VI: Agency Policy – Corrupt and Fraudulent Practices of the Bid Document Part-1**, cannot be remedied by other, less intrusive measures;

l) where the Bidder has been guilty of serious misrepresentation in supplying the information required for the verification of the absence of grounds for exclusion or the fulfilment of the selection criteria, has withheld such information or is not able to submit the supporting documents required pursuant to **Clause 27 of ITB**; or

m) where the Bidder has undertaken to unduly influence the decision making process of the Employer, to obtain confidential information that may confer upon it undue advantages in the procurement procedure or to negligently provide misleading information that may have a material influence on decisions concerning exclusion, selection or award.

Notwithstanding point (a) of the first subparagraph, the Employer might not exclude a Bidder which is in one of the situations referred to in that point, where the Employer has established that the Bidder in question will be able to perform the contract, taking into account the applicable national rules and measures on the continuation of business in the case of the situations referred to in point (a).

Any Bidder that is in one of the situations referred to in the above paragraph may provide evidence to the effect that measures taken by the Bidder are sufficient to demonstrate its reliability despite the existence of a relevant ground for exclusion. If such evidence is considered as sufficient, the Bidder concerned will not be excluded from the procurement procedure.

For this purpose, the Bidder shall prove that it has paid or undertaken to pay compensation in respect of any damage caused by the criminal offence or misconduct, clarified the facts and circumstances in a comprehensive manner by actively collaborating with the investigating authorities and taken concrete technical, organizational and personnel measures that are appropriate to prevent further criminal offences or misconduct.

The measures taken by the Bidder will be evaluated taking into account the gravity and particular circumstances of the criminal offence or misconduct. Where the measures are considered to be insufficient, the Bidder shall receive a statement of the reasons for that decision.

Bidders and all of its associates (if any) and all the members of the “Group” in case of Joint Venture are required as a condition of admission to eligibility, to execute and attach a Covenant of Integrity in the form indicated in **Form 3 A** and an Environmental and Social Covenant in the form indicated in **Form 3 B** of Section-IV: Bidding Forms respectively.

Bidders will also be required to confirm and declare that no agent, middleman or any intermediary has been, or will be, engaged to provide any services, or any other items of work related to the award and performance of this contract.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)****BID DOCUMENTS****FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024****PART 1: BIDDING PROCEDURE  
SECTION III: Evaluation & Qualification Criteria****Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**SECTION-III: Evaluation & Qualification Criteria**

This Section contains all the criteria that the Employer shall use to evaluate bids and qualify Bidders. In accordance with ITB 35 and ITB 37, no other factors, methods or criteria shall be used. The Bidder shall provide all the information requested in the forms included in Section IV, Bidding Forms.

**1. Evaluation**

In addition to the criteria listed in ITB 35.2 the following criteria shall apply:

**1.1 Assessment of adequacy of Technical Proposal with Requirements**

The assessment of the Technical Proposal submitted by a Bidder shall comprise:

- (a) evaluation of the Bidder's technical capacity to mobilize key equipment and key personnel to carry out the works,
- (b) manufacture / construction method,
- (c) manufacture / construction schedule
- (d) Sufficiently detailed supply sources in accordance with requirements specified in Section VII – Works Requirements.

**1.2 Multiple Contracts - Not Applicable****1.3 Alternative Completion Times – Not Applicable****1.4 Technical alternatives – Not Applicable****1.5 Specialized Subcontractors**

Only the specific experience of sub-contractors for specialized works permitted by the Employer will be considered. The general experience and financial resources of the specialized sub-contractors shall not be added to those of the Bidder for purposes of qualification of the bidder.



**2. Qualification**

No.	Subject	Requirement	Single Entity	Joint Venture/ Consortium			Documentation
				(existing or intended)			
				All Parties Combined	Each member	Lead member	
1	Eligibility						
1.1	Nationality	As per clause 4.3 of Section-I: ITB	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Certificate of Incorporation or Registration certificate etc.
1.2	Conflict of Interest	No conflicts of interest in accordance with ITB 4.2	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Form-1 (Letter of Bid)
1.3	Agency Eligibility	Not being ineligible to the Agency financing, as described in ITB 4.3	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Form-3
1.4	Government Owned Entity of the Borrower country	Meet conditions of ITB 4.3	Must meet requirement	Must meet requirement	Must meet requirement	Must meet requirement	Form-3
2.0	Historical Contract Non-Performance						
2.1	History of Non-Performing Contracts	Non-performance of a contract <sup>1</sup> did not occur as a result of contractor's default in the past five (5) years.	Must meet requirement <sup>2</sup>	N/A	Must meet requirement <sup>2</sup>	Must meet requirement <sup>2</sup>	Form-15
2.2	Suspension Based on absence of Bid Security	Not under suspension based on absence of a Bid Security pursuant to ITB 4.4 or withdrawal of a Bid pursuant to ITB 19.9.	Must meet requirement	N/A	Must meet requirement <sup>2</sup>	Must meet requirement <sup>2</sup>	Form-1

<sup>1</sup>Non-performance, as decided by the Employer, shall include all contracts where (a) non-performance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Non-performance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

<sup>2</sup>This requirement also applies to contracts executed by the Bidder as JV member.

2.3	<b>Pending Litigation</b>	Applicant's financial position and prospective long term profitability still sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Applicant.	Must meet requirement	N/A	Must meet requirement <sup>2</sup>	Must meet requirement <sup>2</sup>	Form-15
<b>3.0</b>	<b>Financial Situation and Performance</b>						
3.1 (a)	<b>Financial Capabilities (cash flow)</b>	The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as <b>INR 5.15 Crore</b> for the subject contract.	Must meet requirement	Must meet requirement	N/A	Must meet Min. 50% (Fifty percent) of the requirement	Form-18
<b>3.1 (b)</b>	<b>Bid Capacity</b>	<p>Evaluation of Bid Capacity: -</p> <p>The Bidders will be qualified only if their available bid capacity is more than the <b>INR 61.82 Crore</b> as per MAHA-METRO assessment. Available bid capacity will be calculated based on the following formula:  <b>Available Bid Capacity= 2xAxN – B</b>  Where,  A = Maximum of the value of construction works executed in any one year during the last 05 (five) financial years reckoned up to <b>31<sup>st</sup> March'2023</b>  (Updated to price level of 31 March 2023 assuming 5% (for INR portion) and 2% (for foreign currency portion) inflation per year compounded annually)</p>	Must meet requirement	Must meet the requirement	N/A	N/A	Form-17 & Form-19

		<p>N = Number of years prescribed for completion of the present work</p> <p>B = Value of existing commitments as on first day of the month of this Bid submission i.e. for on-going construction works during completion period of proposed work.</p> <p>Proportionate value will be taken if it falls during the financial year.</p> <p>Note:</p> <ol style="list-style-type: none"> <li><b>The available bid capacity should be more than the estimated cost of the proposed work.</b></li> <li><b>A certificate issued from a Statutory Auditor certifying A and B value must be enclosed with the Technical bid. The certificate must be with UDIN</b></li> </ol>					
3.1 (c)	<b>Net Worth</b>	<p>Net worth of Bidder ending 31<sup>st</sup> March'2023 should be minimum <b>INR 20.60 Crores.</b></p> <p><b>Note: Only Statutory Auditor's certificate required to be enclosed with bid. The certificate must be with UDIN.</b></p>	Must meet requirement	Must meet the requirement	N/A	N/A	Form-16
3.1 (d)	<b>Net Profit</b>	<p>Summery sheet of audited balance sheets for the last <b>5 (five) years (FY 2018-19, 19-20, 20-21, 21-22 &amp; 22-23)</b> shall be submitted and must demonstrate the current soundness of the Applicant's financial position and indicate its prospective long-term profitability.</p>	Must meet requirement	N/A	Must meet requirement	Must meet requirement	Form-16

		<p>The Bidder Must have made <b>Net Profit before tax</b> during any two of the last 5 financial years i.e. <b>(FY 2018-19, 19-20, 20-21, 21-22 &amp; 22-23)</b></p> <p><b>Note:</b></p> <ol style="list-style-type: none"> <li>1. Statutory Auditor's certified summary sheet of each year need to be enclosed with bid. The certificates must be with UDIN</li> <li>2. Copy of audited balance sheets also need to be submitted along with the bid</li> </ol>					
3.2	<b>Average Annual Turnover</b>	<p>Minimum average annual turnover of <b>INR 61.82 Crore</b> within the last 5 (five) years</p> <p><b>Note:-</b></p> <ol style="list-style-type: none"> <li>1. Last five years shall be <b>(FY 2018-19, 19-20, 20-21, 21-22 &amp; 22-23)</b></li> <li>2. In case of Companies, which follows Financial Year as Calendar Year (January to December), data for 2021 shall be treated equivalent to the data of FY 2021-22 and so on.</li> <li>3. Statutory Auditor's certified summary sheet of audited balance sheet need to be enclosed with bid. The certificate must be with UDIN</li> <li>4. Copy of audited balance sheets also need to be submitted along with the bid</li> </ol>	Must meet requirement	Must meet the requirement	N/A	N/A	Form-17

<b>4.0</b>	<b>Experience</b>						
4.1	<b>General Experience</b>	For the Lead Member, experience under contracts (single entity or Lead member of (JV) shall be at least 5 calendar years, (2018 to 2023). Whereas the other members of JV shall be at least two (2) years under similar contracts from 2021 to 2023.	Must meet requirement	N/A	Last 02 Calendar Year	For Lead Member during Last 05 Calendar year	Form-20
4.2 (a)	<b>Specific Construction &amp; Contract Management Experience</b>	<p>A minimum of <b>*Similar Work</b> contracts specified below that have been satisfactorily completed as a prime contractor or joint venture member during last 5 (Five) years reckoned from the last day of the month previous to the one in which the latest date of the bid submission falls.</p> <p>(a) Should have completed/ executed the similar work of value equivalent to at least INR 49.66 <b>Crores under a Single Contract.</b> OR</p> <p>(b) Should have completed/ executed the work of value equivalent to at least INR 31.04 <b>Crores each</b> under minimum <b>two contracts</b> OR</p> <p>(c) Should have completed/ executed the work of value equivalent to at least</p>	Must meet requirement	Must meet the requirement	N/A	N/A	Form-21

		<p>INR <b>24.83 Crores</b> each under minimum three contracts.</p> <p><b>Note:-</b></p> <p>1. <b>*Similar work:</b> Means Any Civil Engineering works, with any Government/Central Government/ Public sector Undertaking(PSU)/Urban local Bodies/Companies listed in stock exchanges of India (BSE and /or/NSE only) during the last preceding five financial years. The completion certificate from the officer not below the rank of Executive Engineer of the concerned department should be submitted.</p>					
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### 3. Special Notes:

- i. For the above mentioned criteria, both completed as well as ongoing works may be considered subjected to production of certificate clearly mentioning the amount paid for completed work from the concerned authority including the status of the work. The value of work executed or under execution shall remain as mentioned in above clause.
- ii. During evaluation of this bid, if the bidder is awarded or is lowest in any other bid under process of evaluation with Maharashtra Metro Rail Corporation (for PMRP), then the bidder has to demonstrate that he aggregately (Combining present tender and previously awarded tender) satisfies criteria mentioned in 3.1a and 3.1b for this tender.
- iii. Full (100%) experience for previous works of the JV shall be considered, if the claiming member of the JV has at least 60% share in previous consortium/ JV for the relevant referred Work Experience, else proportionate quantum of experience of previous works up to the percentage share of participation in the previous JV shall be considered.

- iv. Existing JV/Consortium already worked/working in any department & meeting the eligibility criteria of \*Similar work, mentioned in Section-III of Bid Document, can bid with the same JV configuration as a Single Entity.
- v. If any member has less than 20% share in previous JV/consortium, his experience shall be considered as non-substantial member and shall not be considered for evaluation.
- vi. The JV/Consortium member having maximum % contribution in proposed JV should be treated as Lead Member.
- vii. The mentioned experience must be supported by duly signed and stamped certificate from the employer. Bidder shall submit the contact details of issuing authority of the certificates for verification.
- viii. For evaluation purpose, the value of work shall include the cost of approaches/ embankment; whereas, the length of Bridge/ Overbridge/ Flyover/ Viaduct shall be excluding the length of approaches/ embankment.

**4. Personnel (Bidder shall use Form-4 to submit the detail)**

The Bidder must demonstrate that it has the personnel for the key positions that meet the following requirements:

No.	Position	Minimum Requirement	Qualification	In Similar Works Experience (years)
1	Project Manager	1	Graduate in Civil Engg.	Minimum total experience of 10 years since Degree out of which, minimum 03 years as In-charge in similar works
2	Site Engineers a) Civil b) Electrical	Total 8 7 1	Graduate in Civil/ Electrical Engg/Diploma in Civil/ Electrical Engg as per discipline	Minimum total experience of 5 years for Degree holders, minimum 08 years for Diploma holders in similar works
3	Quantity Surveyor - Billing engineer	1	Graduate in Civil Engg/Diploma in Civil Engg	Minimum total experience of 5 years for Degree holders, minimum 08 years for Diploma holders in similar works
4	Quality Assurance (QA)- Engineer	1	Graduate in Civil Engg.	Minimum total experience of 5 years
5	Surveyor	1	Graduate or Diploma in Civil Engineering	Minimum 5 years for Degree & 8 years for Diploma in execution of similar survey works
6	SHE personnel	As per SHE Manual	As per SHE Manual	As per SHE Manual

**Note:-**

- i. The above requirements are minimum and the contractor should be capable to deploy additional technical work force if required, to meet the progress during the peak time and may also reduce the manpower towards the completion stages of Project with prior approval of Engineer-in-Charge.
- ii. The Bidder shall provide details of the proposed personnel and their experience records using Forms-4, included in Section IV, Bidding Forms.



**5. Equipment (*Bidder shall use Form-8 to submit the detail*)-Deleted**

The Bidder must demonstrate that it has all necessary key equipment's and machineries as adequately required for completion of scope of works.

**Note:**

- i. The Equipment listed above are the minimum requirements and the cost of the same is deemed to be included in the quoted price. However, if they are found to be short and not adequate to complete the works as per key dates, then further equipment to be arranged to accelerate the progress of work. Nothing extra shall be paid against additional deployment of the equipment.
- ii. Hydra/Excavator/Transit Mixers/Man Lifter etc. are to be provided as per the requirements of the said work and the cost of the same is deemed to be included in the quoted price.
- iii. At the time of bidding contractor must demonstrate the possession of required plants & equipment and capability to mobilize within short notice without wasting prime working time.
- iv. All plants and equipment need to be mobilized simultaneously; plants and equipment as required as per the progress of the work shall be brought at site in advance or as directed by Engineer in charge.

The Bidder shall provide further details of proposed items of equipment using Form-8 in Section IV, Bidding Forms.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)****BID DOCUMENTS**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024****PART 1: BIDDING PROCEDURE****SECTION IV: BIDDING FORMS****Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-

411005. Tel- 020-7410004067/68

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)Website: [www.punemetrorail.org](http://www.punemetrorail.org)

Section IV. Bidding Forms

Table of Forms

Sr. No.	Form No.	Name of Form
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04.	Form No.4	Organization Chart & deployment of staff
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09	Form No.9	Quality Assurance plan
10	Form No.10	Outline safety assurance plan
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15	Form No.15	Historical contract non-performance, pending litigations and litigation history
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21	Form No.21	Specific construction and contract management experience
22	Form No.22	Form of bid security
23	Form No.23	Form of joint bidding agreement
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25	Form No.25	Letter of undertaking regarding confidentiality of bid information
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31	Form No.31	Undertaking for passing on benefits of exemptions to Maharashtra Metro Rail Corporation Limited and for adjustment of amounts due from balance due
32	Form No.32	Undertaking for obtaining registrations under various fiscal and labour laws
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34	Form No. 34	Bid Securing Declaration
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37	Form No. 37	Bid Index

**Letter of Bid**

*[The Bidder shall prepare his Letter of Bid on a Letterhead paper specifying his name and address]*

Bidder's Name: - \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

To:

**Maharashtra Metro Rail Corporation Limited**

**Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005, Maharashtra, INDIA**

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Corrigenda/Addenda issued in accordance with Instructions to Bidders (ITB 8) \_\_\_\_\_;
- (b) We have no conflict of interest in accordance with ITB 4;
- (c) We have not been suspended nor declared ineligible by the Employer in absence of a Bid Security in the Employer's country in accordance with ITB 4.4.
- (d) We offer to execute in conformity with the Bidding Documents the following Works: (*name of work*) \_\_\_\_\_;
- (e) Our bid shall be valid for a period of 180 days (*as per BDS*) from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;
- (f) If our bid is accepted, we commit to obtain a performance security in accordance with ITB 42 of the Bidding Documents;
- (g) We are not participating, as a Bidder, in more than one bid in this bidding process in accordance with ITB 4.2(e), other than alternative bids submitted in accordance with ITB 13;
- (j) We have not paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract
- (k) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed; and
- (l) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.
- (m) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder\* \_\_\_\_\_

Name of the person duly authorized to sign the Bid on behalf of the Bidder\*\* \_\_\_\_\_

Title of the person signing the Bid\_\_\_\_\_

Signature of the person named above\_\_\_\_\_

Date signed \_\_\_\_\_ day of \_\_\_\_\_

**Notes:-**

\*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

\*\*: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid

**Form-2****Pro-Forma Letter of Participation from Each Partner of Joint Venture (JV/Consortium)**  
(On each Firm's Letter Head)

Dt. -----

To,  
THE MANAGING DIRECTOR,  
Maharashtra Metro Rail Corporation Limited  
Civil Court Metro Station, Nyayamurti Ranade Path,  
Pune-411005, Maharashtra, INDIA

Sir,

Regarding:

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

We wish to confirm that our company / firm (delete as appropriate) has formed a Joint Venture with  
and for the purposes associated with NIT referred to above.

*(Member(s) who are not the lead partner of the JV/CONSORTIUM should add the following paragraph)\**

'This JV/CONSORTIUM is led by *(Name of lead member)* .....whom we hereby authorize to act on our behalf for the purpose of submission of Bid for ..... and authorize to incur liabilities and receive instructions for and on behalf of any and all the partners or constituents of the Joint Venture.'

OR

*(Member being the lead member of the group should add the following paragraph)\**

'In this group we act as leader and, for the purposes of applying for qualification, represent the Joint Venture.'

In the event of our group being awarded the contract, we agree to be jointly with..... (Names of other members of our JV/CONSORTIUM)..... and severally liable to the Maharashtra Metro Rail Corporation Limited, its successors and assigns for all obligations, duties and responsibilities arising

from or imposed by the contract subsequently entered into between Maharashtra Metro Rail Corporation Limited and our JV/CONSORTIUM.

\*I/We, further agree that entire execution of the contract shall be carried out exclusively through the lead partner.

Yours faithfully,

(Signature)

(Name of Signatory).....

(Capacity of Signatory).....

Seal

\* Delete as applicable

**A. COVENANT OF INTEGRITY**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

To:

**Maharashtra Metro Rail Corporation Limited,**Civil Court Metro Station, Nyayamurti Ranade Path,  
Pune-411005, Maharashtra, INDIA

We, .....(bidder's Name) declare and covenant that neither we nor anyone, including any of our directors, employees, agents, joint venture partners or sub-contractors, where these exist, acting on our behalf with due authority or with our knowledge or consent, or facilitated by us, has engaged, or will engage, in any Prohibited Conduct (as defined below) in connection with the tendering process or in the execution or supply of any works, goods or services for [*specify the contract or tender invitation*] (the "Contract") and covenant to so inform you if any instance of any such Prohibited Conduct shall come to the attention of any person in our organisation having responsibility for ensuring compliance with this Covenant.

We shall, for the duration of the tender process and, if we are successful in our tender, for the duration of the Contract, appoint and maintain in office an officer, who shall be a person reasonably satisfactory to you and to whom you shall have full and immediate access, having the duty, and the necessary powers, to ensure compliance with this Covenant.

We declare and covenant that neither we nor anyone, including any of our directors, employees, agents, joint venture partners or sub-contractors, where these exist, acting on our behalf with due authority or with our knowledge or consent, or facilitated by us, (i) is listed or otherwise subject to EU/UN Sanctions and (ii) in connection with the execution or supply of any works, goods or services for the Contract, will act in contravention of EU/UN Sanctions. We covenant to so inform you if any instance shall come to the attention of any person in our organisation having responsibility for ensuring compliance with this Covenant.

If (i) we have been, or any such director, employee, agent or joint venture partner, where this exists, acting as aforesaid has been, convicted in any court or sanctioned by any authority of any offence involving a Prohibited Conduct in connection with any tendering process or provision of works, goods or services during the five years immediately preceding the date of this Covenant, or (ii) any such director, employee, agent or a representative of a joint venture partner, where this exists, has been dismissed or has resigned from any employment on the



grounds of being implicated in any Prohibited Conduct, or (iii) we have been, or any of our directors, employees, agents or joint venture partners, where these exist, acting as aforesaid has been excluded or otherwise sanctioned by the EU Institutions or any major Multi-lateral Development Bank (including World Bank Group, African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank or Inter-American Development Bank) from participation in a tendering procedure on the grounds of Prohibited Conduct, we give details of that conviction, dismissal or resignation, or exclusion below, together with details of the measures that we have taken, or shall take, to ensure that neither this company nor any of our directors, employees or agents commits any Prohibited Conduct in connection with the Contract [give details if necessary].

We acknowledge that if we are subject to an exclusion decision by the European Investment Bank (EIB), we will not be eligible to be awarded a contract to be financed by the EIB.

We grant [indicate the name of the Project Promoter], the European Investment Bank and auditors appointed by either of them, as well as any authority or European Union institution or body having competence under European Union law, the right to inspect and copy our books and records and those of all our sub-contractors under the Contract. We accept to preserve these books and records generally in accordance with applicable law but in any case for at least six years from the date of tender submission and in the event we are awarded the Contract, at least six years from the date of substantial performance of the Contract.”

For the purpose of this Covenant, Prohibited Conduct has the meaning provided in the EIB’s Anti-Fraud Policy\*\*.

*\*\*EIB’s Anti-Fraud Policy for definitions (<http://www.eib.org/infocentre/publications/all/anti-fraud-policy.htm>)*

**B. ENVIRONMENTAL AND SOCIAL COVENANT**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

To:

**Maharashtra Metro Rail Corporation Limited**Civil Court Metro Station, Nyayamurti Ranade Path,  
Pune-411005, Maharashtra, INDIA

We, .....(bidder's Name) the undersigned, commit to comply with – and ensuring that all of our sub-contractors comply with – all labour laws and regulations applicable in the country of implementation of the contract, as well as all national legislation and regulations and any obligation in the relevant international conventions and multilateral agreements on environment applicable in the country of implementation of the contract.

Labour standards. We further commit to the principles of the eight Core ILO standards<sup>19</sup> pertaining to: child labour, forced labour, non-discrimination and freedom of association and the right to collective bargaining. We will (i) pay rates of wages and benefits and observe conditions of work (including hours of work and days of rest) which are not lower than those established for the trade or industry where the work is carried out; and (ii) keep complete and accurate records of employment of workers at the site.

Workers relations. We therefore commit to developing and implementing a Human Resources Policy and Procedures applicable to all workers employed for the project in line with Standard 8 of the EIB's Environmental and Social Handbook. We will regularly monitor and report on its application to [insert name of the Contracting Authority] as well as on any corrective measures periodically deemed necessary.

Occupational and Public Health, Safety and Security. We commit to (i) complying with all applicable health and safety at work laws in the country of implementation of the contract; (ii) developing and implementing the necessary health and safety management plans and systems, in accordance with the measures defined in the Project's Environmental and Social Management Plan (ESMP) and the ILO Guidelines on occupational safety and management systems<sup>20</sup>; (iii) providing workers employed for the project access to adequate, safe and hygienic facilities as well as living quarters in line with the provisions of Standard 9 of the EIB's Environmental and Social Handbook for workers living on-site; and (iv) using security management arrangements that are consistent with international human rights standards and principles, if such arrangements are required for the project.

Protection of the Environment. We commit to taking all reasonable steps to protect the environment on and off the site and to limit the nuisance to people and property resulting from pollution, noise, traffic and other outcomes of the operations. To this end, emissions, surface discharges and effluent from our activities will comply with the limits, specifications or stipulations as defined in [insert name of the relevant document]<sup>21</sup> and the international and national legislation and regulations applicable in the country of implementation of the contract.

Environmental and social performance. We commit to (i) submitting [insert periodicity as indicated in the tender documents] environmental and social monitoring reports to [insert name of the Contracting Authority]; and (ii) complying with the measures assigned to us as set forth in the environmental permits [insert name of the relevant document if applicable]<sup>22</sup> and any corrective or preventative actions set forth in the annual environmental and social monitoring report. To this end, we will develop and implement an Environmental and Social Management System commensurate to the size and complexity of the Contract and provide [insert name of the Contracting Authority] with the details of the (i) plans and procedures, (ii) roles and responsibilities and (iii) relevant monitoring and review reports.

We hereby declare that our tender price as offered for this contract includes all costs related to our environmental and social performance obligations as part of this contract. We commit to (i) reassessing, in consultation with [insert name of the Contracting Authority], any changes to the project design that may potentially cause negative environmental or social impacts; (ii) providing [insert name of the Contracting Authority] with a written notice and in a timely manner of any unanticipated environmental or social risks or impacts that arise during the execution of the contract and the implementation of the project previously not taken into account; and (iii) in consultation with [insert name of the Contracting Authority], adjusting environmental and social monitoring and mitigation measures as necessary to assure compliance with our environmental and social obligations.

Environmental and social staff. We shall facilitate the contracting authority's ongoing monitoring and supervision of our compliance with the environmental and social obligations described above. For this purpose, we shall appoint and maintain in office until the completion of the contract an Environmental and Social Management Team (scaled to the size and complexity of the Contract) that shall be reasonably satisfactory to the Contracting Authority and to whom the Contracting Authority shall have full and immediate access, having the duty and the necessary powers to ensure compliance with this Environmental and Social Covenant.

We accord the Contracting Authority and the EIB and auditors appointed by either of them, the right of inspection of all our accounts, records, electronic data and documents related to the environmental and social aspects of the current contract, as well as all those of our subcontractors.

Name

In the capacity of

Signed

Duly authorised to sign the contract for and on behalf of

Date

<sup>19</sup> <http://www.ilo.org/global/standards/introduction-to-international-labour-standards/conventions-and-recommendations/lang--en/index.htm>

<sup>20</sup> [http://www.ilo.org/safework/info/standards-and-instruments/WCMS\\_107727/lang--en/index.htm](http://www.ilo.org/safework/info/standards-and-instruments/WCMS_107727/lang--en/index.htm)

<sup>21</sup> For instance: ESIA (Environmental and Social Impact Assessment) and ESMP (Environmental and Social Management Plans).

<sup>22</sup> For instance: ESIA (Environmental and Social Impact Assessment) and ESMP (Environmental and Social Management Plans).

**Organization Chart & Deployment of staff**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Bidder shall provide with the Bid a complete Schedule of deployment and Organization chart in the table below:

S.No.	Name	Qualification	Designation

**Note:**

The above shall be submitted by the bidder in accordance with the clause no.4 of Section-III, (Evaluation & Qualification Criteria), of Part-1 of Bid Document.

**Resume of Proposed Key Personnel****(In accordance with clause no.4 of Section-III, (Evaluation & Qualification Criteria), of Part-1 of Bid Document)**

<b>Key Position as per Tender:</b>		
<b>Personnel information</b>	<b>Name</b>	<b>Date of Birth</b>
	<b>Professional qualifications</b>	
<b>Present employment</b>	<b>Name of employer</b>	
	<b>Address of employer</b>	
	<b>Job title</b>	<b>Reporting Manager Contact:</b> <b>Name:</b> <b>Telephone</b> <b>E-mail</b> <b>HR Manager Contact:</b> <b>Name:</b> <b>Telephone</b> <b>E-mail</b>
	<b>No of Years in present employment</b>	
<b>Overall Experience</b>	<b>Total Experience .....years.</b>	<b>Similar Experience.....years.</b>

Summarize professional experience over the last 20 years, in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant technical and management experience

Method Statement

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

Each Bidder shall set out details of the Method Statement for the Works to demonstrate how it will meet the Employer's objective and requirements. As a minimum, the Method Statement shall address the following:

- (a) Details of the arrangements and methods which the Bidder proposes to implement for the construction of the Works, in sufficient detail to demonstrate their adequacy to achieve the requirements of the Contract including completion within the Time for Completion stated in the Particular Conditions of Contract.
- (b) Outline of the arrangements of the Bidder to manage coordination of Site access.
- (c) Comments on the geotechnical and subsurface aspects of the Works including materials, material sources and any constraints.
- (d) [Comments on any offshore or waterfront aspects of the Works.]; e.g. schedule of components to be manufactured off-shore and description of plants to be imported etc.
- (e) Comments on logistics and traffic management *[as may be appropriate]*.
- (f) Outline of the arrangements and organisation of the Bidder to ensure compliance with the Works Requirements.
- (g) Outline of the arrangements of the Bidder to carry out testing upon completion as specified in the Works Requirements.
- (h) The type of Superstructure proposed to be adopted may be submitted in detail (applicable for D&B viaduct work)
- (i) *[Insert other information, as may be appropriate.]*

**Works Programme**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

1. The Bidder shall submit a Work Plan as a part of the Bid, which shall contain the following:
  - a. Proposed Works Programme.
2. The Bidder's proposed Works Programme shall indicate how the Bidder intends to organize and carry out the Works and achieve Stages and complete the whole of the Works by the appropriate Key Dates. The Works Programme shall be prepared in terms of weeks from the Commencement Date of Works.
3. The Bidder's Design Submission Programme shall cover the Design phase and include a schedule identifying, describing, cross-referencing and explaining the Design Packages and submissions, which it intends to submit.
4. The Design Submission Programme should take due account of the design coordination interface periods with other Designated Contractors and be consistent with the Works Programme.
5. The Works Programme shall include details as stipulated in Chapter 2 and 3 of the Works Requirements – General Specification, for review by the Engineer.
6. The proposed Works Programme or Programmes shall be developed as a critical path network using the Precedence Diagramming Method and be presented in bar chart and time scaled logic network format and shall clearly show the division of the Works, the start and completion dates for each activity and their inter-relationships and Key Dates. The network must be fully resourced and show the co-ordination with Designated Contractors.
7. The proposed Works Programme shall show achievement of all Key Dates as mentioned in **Section IX: Annexure-IX- G**.
8. The proposed Works Programme shall contain sufficient detail to assure the Employer of the feasibility of the plan and approach proposed by the Tenderer.
9. The Bidder should have regard to the possibility, as per Instructions to Bidders that during the bid evaluation period the proposed Works Programme may be developed into a Programme which, in the event of award of the Contract, would be the submission of the Preliminary Works Programme. To facilitate this process the Bidder shall, in the preparation of the proposed Works Programme, take due account of the provisions of Works Requirements in so far as they concern the Works Programme.
10. The proposed Works Programme shall be accompanied by a narrative statement that shall describe Programme activities, assumptions and logic in developing the works programme for Construction, EMP works etc.

This narrative statement shall also indicate which elements of the Works, the Bidder intends to carry out off-shore and/or in India with details of the proposed locations of where any such work is to be



carried out, the facilities available and/or proposed to be set up. In particular the Bidder must clearly bring out how major activities (specifically the following) are proposed to be executed and explain his ability to mobilize the required plant, machinery and resources for the same.

11. The Bidders' attention is drawn to the Programme Logic Diagrams, which shows the general relationship between the Works under the Contract, Contract periods of Designated Contracts and Key Dates (Section IX. Particular Conditions Part A – Contract Data 'Table: Summary of Sections') (including that for completion of the Works). The logic diagrams shall be developed and submitted along with the Works Programmes as submitted during the course of the Works.

**Form-7****Certificate of Compliance**

(On Bidder's Letterhead)

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

This Certificate is issued in the full knowledge that the Bid for the above referred work including the Technical Proposals submitted by us, are in Clause-by-Clause Compliance with the provisions of Bid Document i.e ITB, BDS, EQC, Works Requirements and other specifications, including Addenda/Corrigenda etc. thereon, accompanying the proposal.

**Signed  
Authorized Representative****Seal:****Date:**

**Form-8****Deleted****Deployment of Construction Machinery/ Equipment / Systems**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

SN	Name of the Construction Machinery/ equipment / system	Min nos. required	Name of manufacturer and address	Year of Manufacture
1	2	3	4	5
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

**Note:**

1. The above shall be submitted by the bidder in accordance with the clause no.5 of Section-III, (Evaluation & Qualification Criteria), of Part-1 of Bid Document.

**Quality Assurance Plan**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Contractor shall establish and maintain a Quality Assurance System in construction procedures and the interfaces between them. This Quality Assurance system shall be applied without prejudice to, or without in any way limiting, any Quality Assurance Systems that the Contractor already maintains.

The Bidder shall submit as part of his Bid an Outline Quality Plan which shall contain sufficient information to demonstrate clearly the Bidder's proposals for achieving effective and efficient Quality Assurance System. The Outline Quality Plan should include an outline of the procedures and regulations to be developed and the mechanism by which they will be implemented for ensuring Quality as required.

The Bidder may be requested to amplify, explain or develop its Outline Quality Plan prior to the date of acceptance of the Bid and to provide more detail with a view to reaching provisional acceptance of such a plan.

Overall responsibility for Quality Assurance for construction / manufacture, testing, commissioning and DLP shall be with the bidder or jointly and severally of each member in case of JV/Consortium.

**Outline Safety Assurance Plan**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Bidder shall submit as part of its Bid an Outline System Safety Assurance Plan which shall contain sufficient information to demonstrate clearly the Bidder's proposals for achieving effective and efficient safety procedures in the design, construction / manufacture, transport, integrated testing and commissioning of Works.

The Outline System Safety Assurance Plan should include an outline of the safety procedures and regulations to be developed and the mechanism by which they will be implemented for ensuring safety including Hazard Analysis, Fire Control, Electromagnetic compatibility / Electro-magnetic Interference Control, reliability, availability and maintainability as given in this Bid.

The Bidder shall also include in the Outline Safety Plan sufficient information to demonstrate clearly the Bidder's proposal for the safety of the Works / Plant / Equipment and personnel at the site. On the basis of this information, the Contractor shall develop a Detailed Site Safety Plan as given in this Bid.

The Outline System Safety Assurance Plan shall be headed with a formal statement of policy in relation to safety and shall be sufficiently informative to define the Bidder's safety plans and set out in summary an adequate basis for the development of the Safety Plan to be submitted in accordance with the conditions of this Bid.

The Bidder may be requested to amplify, explain or develop its Outline System Safety Assurance Plan prior to the date of acceptance of the Bid and to provide more details with a view to reaching provisional acceptance of such a Plan.

**Outline Safety, Health and Environmental Plan**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Bidder shall submit as part of his Bid an Outline Safety, Health & Environment Plan which shall contain sufficient information to demonstrate clearly the Bidder's proposals for achieving effective and efficient compliance to the conditions of contract on SHE manual (Refer: Section-XI of Part-3). The Outline Plan should include an outline of the procedures and regulations to be developed and the mechanism by which they will be implemented for ensuring safety as required by Sub-Clause 4.18 of the GC.

The Outline Plan shall be headed with a formal statement of policy in relation to Safety, Health & Environment protection and shall be sufficiently informative to define the Bidder's plans and set out in summary an adequate basis for the development of the Site Safety, Health & Environment Plan to be submitted in accordance with Sub-Clause 4.18 of the GC.

The Bidder may be requested to amplify, explain or develop its Outline Environmental Plan prior to the date of issue of Letter of Acceptance and to provide more details with a view to reaching provisional acceptance of such a plan.

**Outline Project Management Plan**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Bidder shall submit with its Bid a Project Management Plan as prescribed in Works Requirements - inter-alia indicating names, qualifications, professional experience and corporate affiliation of all proposed key management and engineering personnel (above the level of supervisor) and specialists.

The Bidder shall include its proposals for its Co-ordination Control Team and include the name and qualifications of the Team Leader responsible for the interface co-ordination with Designated Contractors.

The Bidders shall provide a complete staffing schedule and organization chart as required under **clause-5, Section-III of Part-1 of Bid Document**.

The Bidder shall include in its proposals the methods that it shall employ to implement the Employer's requirements for Quality, Safety and Environmental Assurance. These shall include a commentary on how the programmes shall be initiated, maintained and reported, the tests that shall be carried out, and who shall be responsible for controlling and monitoring the programmes.

**Bidder's Information Form**

Bidder's Name:- \_\_\_\_\_

JV/Consortium member's Name \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

S.No.	Description	Information
1	Bidder's name	
2	In case of Joint Venture /Consortium, name of each member & a separate information form for each member shall be filled & enclosed.	
3	Bidder's country of registration: <i>[indicate country of Constitution]</i>	
4	Bidder's legal address [in country of registration]:	
5	Bidder's year of incorporation:	
6	Core Business	
7	Principal place of business	
8	Contact No. Of main Office at Principal place of business.	
9	Bidder's Present Address of Correspondence:	
10	E-Mail ID	
11	Bidder's authorized representative's information (As per POA / Declaration of authorized signatory)	
12	Name:	
13	Designation	
14	Address	
15	Telephone No.	



16	Mobile No.	
17	E-Mail ID	
18	PAN NO.(If Indian bidder)-Copy to be enclosed	
19	GST No. (If Indian bidder)-Copy to be enclosed	
20	Attach copies of original documents of following	
	Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above.	
	(b) In case of JV/Consortium, letter of intent to form JV/Consortium or JV/Consortium agreement, in accordance with ITB 4.1.	
	(c) In case of Government-owned enterprise or institution, in accordance with ITB 4.3 documents establishing: <ul style="list-style-type: none"> <li>• Legal and financial autonomy</li> <li>• Operation under commercial law</li> <li>• Establishing that the Bidder is not dependent agency of the Employer</li> </ul>	
21	Power of Attorney in favour of authorized signatory supported by board resolution	
22	A list of Board of Directors with DIN No., and the beneficial ownership.	

**Bidder's JV/Consortium Information Form**  
*(to be completed for each member of Bidder's JV/Consortium and any Specialized subcontractor if applicable)*

Bidder's Name:- \_\_\_\_\_

JV/Consortium member's Name \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

Description	Information
Bidder's JV/Consortium name:	
JV/ Consortium member's name alongwith % participation and role (Lead / Other member):	
JV/ Consortium member's country of registration:	
JV/ Consortium member's year of constitution:	
JV/ Consortium member's legal address in country of constitution:	
JV/ Consortium member's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____	
1. Attached are copies of original documents of <input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/ or registration documents of the legal entity named above. <input type="checkbox"/> In case of a Government-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and absence of dependent status, in accordance with ITB 4.3. 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.	

**Historical Contract Non-Performance, Pending Litigation and Litigation History**  
**(to be completed by the Bidder and by each member of the Bidder's JV/Consortium)**

Bidder's Name:- \_\_\_\_\_

JV/Consortium member's Name \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
<input type="checkbox"/> Contract <b>non-performance did not occur</b> since 1 <sup>st</sup> January <i>[insert current year number less 5]</i> specified in Section III, Evaluation and Qualification Criteria, Clause No. 2.1.			
<input type="checkbox"/> Contract(s) <b>not performed as indicated below</b> since 1 <sup>st</sup> January <i>[insert current year number less 5]</i> specified in Section III, Evaluation and Qualification Criteria, requirement, Clause No. 2.1			
Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (INR)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for nonperformance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
Pending Litigation, in accordance with Section III, Qualification Criteria and Requirements			
<input type="checkbox"/> No pending litigation in accordance with Section III, Qualification Criteria and Requirements, Clause No.2.3.			
<input type="checkbox"/> Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Clause No. 2.3 as indicated below.			
Year of dispute	Amount in dispute (currency)	Contract Identification	Total Contract Amount (INR)
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: _____ Status of dispute: _____	

**Financial Situation and Performance of Bidder**

Bidder's Name: \_\_\_\_\_  
 JV Member's Name \_\_\_\_\_  
 Tender Number \_\_\_\_\_  
 Name of Work \_\_\_\_\_

	Historic information for previous 05 Financial years				
Type of Financial Information	2018-19	2019-20	2020-21	2021-22	2022-23
<b>Statement of Financial Position (Information from Balance Sheet)</b>					
Total Assets (TA)					
Total Liabilities (TL)					
Current Assets (CA)					
Current Liabilities (CL)					
Current Ratio (CA/CL)					
Liquid Assets (LA)					
Liquid Liabilities (LL)					
Liquid Ratio (LA/LL)					
Working Capital (WC=CA-CL)					
Net Worth (NW)					
Cash & Cash Equivalent (Including Bank Balance)					
Sundry Debtors					
<b>Information from Income Statement</b>					
Total Revenue/Turnover (TR)					
Profits Before Taxes (PBT)					
Profit After Taxes (PAT)					

\* See Section \_\_\_\_\_, Evaluation and Qualification Criteria, Clause No. \_\_\_\_\_

(Signature of the Authorised Signatory):  
 (Name and designation of the Authorised Signatory):

.....

Seal of Bidder.

**Note:**

- 1) In addition to the above Form, the Bidder shall provide a Certificate from Statutory Auditor certifying the above information along with valid UDIN.
- 2) Bidder are required to attach Financial Statements of preceding five Financial Year.
- 3) Net Worth (NW) means the aggregate value of the paid up share capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditures and misc. expenditures not written- of, as per the audited balance sheet but does not include reserves created out of revaluation of assets, write back of depreciation and amalgamation.
- 4) For all annual financial statements, periods mentioned are ending with 2022-23. In case of ending of financial is Month of December then, annual financial statements shall be ending with financial year 2023.

**Average Annual Turnover**

Bidder's Name: \_\_\_\_\_

JV Member's Name \_\_\_\_\_

Tender Number \_\_\_\_\_

Name of Work \_\_\_\_\_

	Annual turnover data			
Year	INR	Exchange Rate	Equivalent Amount (INR)	Updated value to Current year (Note 2)
	<i>(Indicate amount &amp; Currency)</i>			
2022-23				
2021-22				
2020-21				
2019-20				
2018-19				
Average Annual Turnover *				

\* See Section\_\_\_\_\_, Evaluation and Qualification Criteria, Clause No. \_\_\_\_\_

(Signature of the Authorised Signatory)

(Name and designation of the Authorised Signatory):

.....

Seal of Bidder.

**Note:**

- 1) *In addition to the above Form, the Bidder shall provide a Certificate from Statutory Auditor certifying the above information with valid UDIN.*
- 2) *All prices in foreign currency will be converted to Indian Rupees using the Exchange Rates for those currencies published by the Reserve Bank of India on the day 28 days (Base date) prior to the date of Bid submission.*

## Form-18

## Financial Resources

Bidder's Name: \_\_\_\_\_  
JV Member's Name \_\_\_\_\_  
Tender Number \_\_\_\_\_  
Name of Work \_\_\_\_\_

Specify proposed sources of financing, such as liquid assets, lines of credit, and other financial, other than any contractual advance payments, net of current commitments, available to meet the cash flow requirement of the subject contract as specified in Section \_\_\_\_\_ Clause No. \_\_\_\_\_ (Evaluation and Qualification Criteria)

S. No.	Source of Finance	Amount (Indicate Currency)	Amount (In Equivalent INR)
1	Working Capital		
2	Bank CC & OD		
3	Line of Credit		
4	Any other Sources of Finance		
	Total Financial Resources		

(Signature of the Authorised Signatory)  
(Name and designation of the Authorised Signatory):  
.....

Seal of Bidder.

**Note:**

- (i) **Bankers Certificate for sanctioned Line of Credit to be submitted.**
- (ii) **In addition to the above Form, the Bidder shall provide a Certificate from Statutory Auditor certifying the above information.**

Form-19

**Current Contract Commitments / Works in Progress**

Bidder's Name: \_\_\_\_\_

JV Member's Name \_\_\_\_\_

Tender Number \_\_\_\_\_

Name of Work \_\_\_\_\_

Bidders and each member to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

**Current Contract Commitments**

S.No.	Name of Contract	Employer Name, address, Contact details, Email	Value of Outstanding work (Eq. INR)	Value of Outstanding work (Eq. INR)	Estimated Completion date	Average monthly invoicing of last six months ( INR/monthly)
1						
2						
3						
4						
5						
6						
	<b>Total</b>					

(Signature of the Authorised Signatory)

(Name and designation of the Authorised Signatory):

.....

Seal of Bidder.

**Note: In addition to the above Form, the Bidder shall provide a Certificate from Statutory Auditor certifying the above information.**

**General Construction / Works Experience***(Each Bidder or member of a JV/Consortium must fill this form)*

Bidder's Name: \_\_\_\_\_

JV/CONSORTIUM Member's Name \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

Starting Year*	Ending Year	Contract Identification	Role of Bidder
		Name of Work: _____ Name, Address and <i>E-Mail ID</i> of Employer: _____ Contract value (as well as Revised Contract value if any): Status of work: On-Going/ Completed Date of Commencement: Date of Completion: Value of Work Executed (As per Experience Certificate):	
		Name of Work: _____ Name, Address and <i>E-Mail ID</i> of Employer: _____ Contract value (as well as Revised Contract value if any): Status of work: On-Going/ Completed Date of Commencement: Date of Completion: Value of Work Executed (As per Experience Certificate):	
		Name of Work: _____ Name, Address and <i>E-Mail ID</i> of Employer: _____ Contract value (as well as Revised Contract value if any): Status of work: On-Going/ Completed Date of Commencement: Date of Completion: Value of Work Executed (As per Experience Certificate):	

\* See Section III Evaluation and Qualification Criteria – Clause No. 4.1

**Note:**

In support of the above, bidders are required to enclosed copy of work completion certificate issued by previous employer.



**Specific Construction /Similar Works and Contract Management Experience***(Each Bidder or member of a JV/CONSORTIUM must fill this form)*

Bidder's Name: \_\_\_\_\_

JV/CONSORTIUM Member's Name \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

Similar Contract No.	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV/CONSORTIUM <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Sub-contractor <input type="checkbox"/>
Total Contract Amount (INR)				
If member in a JV/CONSORTIUM or sub-contractor, specify participation in total Contract amount				
Employer's Name:				
Address:				
Telephone/fax number				
E-mail:				

\* See Section III Evaluation and Qualification Criteria – Clause No. 4.2(a)

**Note:-**

In support of the above, bidders are required to enclosed work completion certificate issued by previous employer

**Specific Construction / Similar Works and Contract Management Experience (continue.)**

<b>Similar Contract No.</b>	<b>Information</b>
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items / Nos	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	

**Notes:**

1. Documentary proof such as completion certificates from client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be submitted. The offers submitted without this documentary proof shall not be evaluated.
2. In case the work is executed for private client, copy of work order, bill of quantities, bill wise details of payment received certified by CA, TDS certificates for all payments received and copy of final/last bill paid by client shall be submitted.
3. Value of successfully completed portion of any ongoing work up to date of Bid submission will also be considered for qualification of work experience criteria.

**Form of Bid Security  
(Demand Guarantee)**

Beneficiary: \_\_\_\_\_ Date: \_\_\_\_\_

**PERFORMANCE GUARANTEE No.:** \_\_\_\_\_**Guarantor:** \_\_\_\_\_

We have been informed that \_\_\_\_\_ (hereinafter called "the Applicant") has entered into Contract No. \_\_\_\_\_ dated \_\_\_\_\_ with the Beneficiary, for the execution of \_\_\_\_\_ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, waiving all objections and defences under the aforementioned contract, hereby irrevocably and independently undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of \_\_\_\_\_ (\_\_\_\_),<sup>1</sup> such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's first demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant has failed to duly perform the aforementioned contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the .... Day of ....., 2...<sup>2</sup>, and any demand for payment under it must be received by us at this office indicated above on or before that date.

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

\_\_\_\_\_  
[signature(s)]

<sup>1</sup> The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

<sup>2</sup> Insert the date twenty-eight days after the expected completion date. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

**Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.**

**Form of Joint Bidding Agreement**  
(JV/ Consortium Agreement)

*(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution, duly signed on each page and duly notarised by Notary Public. Foreign entities submitting the Bid are required to follow the applicable law in their country)*

FORM OF JV/CONSORTIUM AGREEMENT BETWEEN  
M/S....., M/S.....,  
M/S..... AND M/S.....  
FOR (.....)

THIS Consortium Agreement (hereinafter referred to as "Agreement") executed on the.....  
day of ..... (.....)

..... a company incorporated under the laws of .....  
and having its Registered Office at ..... (hereinafter called the  
"Party 1", which expression shall include its successors, executors and permitted assigns), and

..... a company incorporated under the laws of .....  
and having its Registered Office at ..... (hereinafter called the "Party 2", which  
expression shall include its successors, executors and permitted assigns) and

..... a Company incorporated under the laws of .....  
and having its Registered Office at .....  
..... (hereinafter called the "Party 3", which expression shall include its  
successors, executors and permitted assigns)

*(The Bidding Consortium should list the name, address of its registered office and other details of all the Consortium Members)*

for the purpose of submitting the Bid in response to the Bidding Documents and in the event of selection as Successful Bidderto execute the Contract Agreement and/or other requisite documents, and to carry out the '.....' ("Works") for Maharashtra Metro Rail Corporation Limited (Name of Project.....) to be awarded by Maharashtra Metro Rail Corporation Limited (hereinafter referred as "Maharashtra Metro Rail Corporation Limited" or "the Company").

Party 1, Party 2, and Party 3 are hereinafter collectively referred to as the "Parties" and individually as a "Party".

WHEREAS Maharashtra Metro Rail Corporation Limited desired to engage a contractor for ..... [name of the Works] for Maharashtra Metro Rail Corporation Limited Rail Project.

AND WHEREAS the Consortium of [.....] (insert the names of all the Members) intends to participate for the Bid, against the Bidding Documents issued to ..... [Insert the name of purchaser of Bidding Document].

AND WHEREAS Para BDS ITB 4.7 of the Instructions to Bidder stipulates that the Bidders bidding on the strength of a Consortium shall submit a legally enforceable Consortium Agreement in a format specified in the Bidding Documents.

NOW THEREFORE, THIS INDENTURE WITNESSTH AS UNDER:

In consideration of the above premises and agreement, all the parties in this Consortium do hereby mutually agree as follows:

1. In consideration of the selection of the Consortium as the Successful Bidderby the Company, we the Members of the Consortium and Parties to the Consortium Agreement do hereby unequivocally

agree that M/s..... (Insert name of the Lead Member), shall act as the Lead Member as defined in the Bidding Documents for self and agent for and on behalf of ..... (the names of all the other Members of the Consortium to be filled in here) to do on behalf of the Consortium, all or any of the acts, deeds or things necessary or incidental to the Consortium's Bid for the Contract including submission of the Bid, participating in meetings, responding to queries, submission of information/ documents and generally to represent the Consortium in all its dealings with Maharashtra Metro Rail Corporation Limited or any other Government Agency or any person, in connection with the Works until culmination of the process of bidding till the Contract is entered into with Maharashtra Metro Rail Corporation Limited and thereafter till the expiry of the Contract.

2. The Lead Member is hereby authorized by the Members of Consortium and Parties to the Consortium Agreement to bind the Consortium, incur liabilities and receive instructions for and on behalf of all Members. It is agreed by all the Members that entire execution of the Contract including payment shall be carried out exclusively through the Lead Member.
3. The Lead Member shall be liable and responsible for ensuring the individual and collective commitment of each of the Members of the Consortium in discharging all their respective obligations under the Contract with Maharashtra Metro Rail Corporation Limited. Each Consortium Member further undertakes to be individually liable for the performance of its part of the obligations without in any way limiting the scope of collective liability envisaged in this Agreement.
4. In case of any breach of any of the obligations as specified under clause 3 above by any of the Consortium Members, the Lead Member shall be liable to fulfil such obligation.
5. It is agreed that sharing of responsibilities hereto among the Consortium members shall not in any way be a limitation of responsibility of the Lead Member under these presents.
6. This Consortium Agreement shall be construed and interpreted in accordance with the Laws of \_\_\_\_\_.
7. It is hereby agreed that the Lead Member shall furnish the Bid Security, as stipulated in the Bidding Documents, on behalf of the Consortium.
8. It is hereby agreed that in case of selection of bidding Consortium as the Successful Bidder, the Parties to this Consortium Agreement do hereby agree that the Lead Member shall furnish the Performance Security on behalf of the Consortium, as stipulated in the Bidding Documents.
9. It is further expressly agreed that the Consortium Agreement shall be irrevocable and, for the Successful Bidder, shall remain valid over the term of the Contract, unless expressly agreed to the contrary by the Company.
10. The Lead Member is authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the Consortium Members respectively from time to time in response to the Bidding Documents for the purposes of the Bidding.
11. It is expressly understood and agreed between the Members that the responsibilities and obligations of each of the Members shall be as follows:  
.....  
.....
12. It is agreed by the Members that the above sharing of responsibilities and obligations shall not in any way be a limitation of joint and several responsibilities and liabilities of the Members, with regards to all matters relating to the execution of the Works as envisaged in the Bidding Documents and the Contract. The Parties shall be jointly and severally liable for execution of the Works in accordance with the terms of the Contract and the Bidding Documents.
13. It is clearly agreed that the Lead Member shall ensure performance under the Contract and if one or more Consortium Members fail to perform its /their respective obligations under the

agreement(s), the same shall be deemed to be a default by all the Consortium Members.

14. It is hereby agreed that in case of selection of the Consortium as the Successful Bidder, [the Lead Member shall furnish the Performance Security on behalf of the Consortium as stipulated in the Bidding Documents] / [the Performance Security as stipulated in the Bidding Documents shall be furnished by the Members on behalf of the Consortium in such proportion as may be agreed to between us]
15. It is agreed by all the Members that there shall be separate Consortium Bank Account (distinct from the bank accounts of the individual Members) to which the individual Members shall contribute their share capital and/or working capital and the financial obligations of the Consortium shall be discharged through the said Consortium Bank Account only and also all the payments received by the Consortium from the Employer shall be through that account alone.
16. It is hereby expressly agreed between the Parties to this Consortium Agreement that neither Party shall assign or delegate its rights, duties or obligations under this Agreement except with prior written consent of the Company.
17. We hereby agree to ratify all acts, deeds and things lawfully done by the aforesaid Lead Member pursuant to this Agreement and that all acts, deeds and things done by the aforesaid Lead Member shall and shall always be deemed to have been done by us/Consortium.

#### This Consortium Agreement

- (a) has been duly executed and delivered on behalf of each Party hereto and constitutes the legal, valid, binding and enforceable obligation of each such Party,
- (b) sets forth the entire understanding of the Parties hereto with respect to the subject matter hereof including the Consortium/Bidder's legal persona and there is or are no other agreements relating to the Consortium/Bidder's incorporation, constitution, powers or organisation which may affect in any way its ability to carry out the Works;
- (c) may not be amended or modified except in writing signed by each of the Parties and with prior written consent of the Company.

IN WITNESS WHEREOF, the Parties to the Consortium Agreement have, through their authorized representatives, executed these presents and affixed common seals of their respective companies on the Day, Month and Year first mentioned above.

Common Seal of .....  
has been affixed in my/our  
presence pursuant to the  
Board of Director's resolution  
dated .....

For and on behalf of  
Consortium Member (party 1)  
M/s.....

.....  
(Signature) (Signature of authorized  
representative)

Name: .....  
Designation:.....  
Place: .....  
Date: .....

Name: .....  
Designation: .....

Witness:

1. ....  
(Signature)  
Name .....

Designation.....

2. ....

(Signature)

Name .....

Designation.....

Common Seal of .....  
has been affixed in my/our  
presence pursuant to the  
Board of Director's  
resolution dated .....

For and on behalf of  
Consortium Member (Party 2)  
M/s.....

.....

(Signature)

Name:

Designation:

Place:

Date:

.....  
(Signature of authorized  
representative)

Name:

Designation:

WITNESS

1. ....

(Signature)

Name .....

Designation.....

2. ....

(Signature)

Name .....

Designation.....

Attested:

.....

(Signature)

(Notary Public)

Place: .....

Date: .....

Common Seal of .....  
has been affixed in my/our  
presence pursuant to the  
Board of Director's  
resolution dated .....

For and on behalf of  
Consortium Member (Party 3)  
M/s.....

.....

(Signature)

Name:

.....  
(Signature of authorized  
representative)

Name:

Designation:  
Place:  
Date:

Designation:

WITNESS

1. ....  
(Signature)  
Name .....

Designation.....

2. ....  
(Signature)  
Name .....

Designation.....

Attested:

.....  
(Signature)  
(Notary Public)

Place: .....  
Date: .....



**Form of Legal Capacity / Power of Attorney**  
(Refer ITB20.2)

(To be forwarded on the letterhead of the Bidder or Lead Member of JV/Consortium, as the case may be)

**Format for Board Resolution****(A) Format for the Board resolution to be passed by a Bidder (not applicable in case of JV/Consortium)**

The Board, after discussion, at the duly convened Meeting on ..... (Insert date), with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956, passed the following Resolution:

RESOLVED THAT pursuant to the applicable provisions of the Companies Act, 1956 and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to submit a Bid in response to the Bidding Documents dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited (Maharashtra Metro Rail Corporation Limited) for *[Insert name of the work]* for Maharashtra Metro Rail Corporation Limited.

FURTHER RESOLVED THAT Mr./Ms....., (insert the name and designation of the concerned official of the Company) be and is hereby authorized to take all the steps required to be taken by the Company for submission of the aforesaid Bid, including in particular, signing the Bid, making changes thereto and submitting amended Bid, signing and executing all the documents related to the Bid, certified copy of this Board resolution or letter or undertakings, etc., required to be submitted to Maharashtra Metro Rail Corporation Limited as part of the Bid or such other documents as may be necessary in this regard and to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to submission of our said Bid including signing and executing the Contract Documents, making representations to Maharashtra Metro Rail Corporation Limited or any other authority, and providing information / responses to Maharashtra Metro Rail Corporation Limited, representing us in all matters before Maharashtra Metro Rail Corporation Limited, and generally dealing with Maharashtra Metro Rail Corporation Limited in all matters in connection with our Bid till the completion of the bidding process as per the terms of the above said Bidding Documents and further till the Contract is entered into with Maharashtra Metro Rail Corporation Limited and thereafter till the expiry of the Contract.

FURTHER RESOLVED THAT a power of attorney as per the draft attached to the Bidding Documents be issued in favour of the above named person, \_\_\_\_\_, to be executed by Mr. \_\_\_\_\_ or Mr. \_\_\_\_\_, Directors of the Company under the Common seal of the Company, affixation thereof to be witnessed by one or both of the above named Directors and by Mr. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) or as per the Memorandum and Articles of Association of the Company.

Signature and stamp of Company Secretary / Managing Director/Directors of Bidding entity

**Notes:**

1. This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Managing Director/Director of the Bidder.
2. The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.
3. In the event the Board resolution is from a company incorporated outside India, the same needs to be notarized by a notary in the home country of company passing the resolution and legalized by the Indian Embassy there. However, in case such company is from a country which has signed The Hague Legislation Convention 1961, then the Board Resolution is not required to be legalized by the Indian Embassy if it carries a conforming Apostille certificate.
4. This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.

Or

**(B) Format for the Board resolution to be passed by “Lead Member” of JV/Consortium (applicable in case the Bidder is a JV/Consortium)**

The Board, after discussion, at the duly convened Meeting on ..... (Insert date), with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956, passed the following Resolution:

RESOLVED THAT pursuant to the applicable provisions of the Companies Act, 1956 and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to submit a Bid in response to the Bidding Documents dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited (Maharashtra Metro Rail Corporation Limited) for ‘.....’ [Name of the work] for Maharashtra Metro Rail Corporation Limited in Consortium with \_\_\_\_\_ (insert the name and address of the other Consortium members).

FURTHER RESOLVED THAT pursuant to the applicable provisions of the Companies Act, 1956 and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to execute a **JV/Consortium Agreement** as per the format annexed to the aforesaid Bidding Documents with \_\_\_\_\_ (insert the name and address of the other **JV/Consortium** members).

FURTHER RESOLVED THAT approval of the Board be and is hereby accorded to the Company to accept and act as the **Lead Member** of the aforesaid **JV/Consortium** and also as true and lawful attorney to do in the name and on behalf of the **JV/Consortium**, all such acts, deeds and things necessary in connection with or incidental to submission of Consortium’s Bid in response to the Bidding Documents dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited for ‘.....’ [name of the work] including signing and submission of the Bid and all

documents related to the Bid as specified in the Bidding Documents, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document, which Maharashtra Metro Rail Corporation Limited may require us to submit and carrying out the Contract and doing all necessary deeds and things as may be required in respect of the above and also for making representations to Maharashtra Metro Rail Corporation Limited and providing information / responses to Maharashtra Metro Rail Corporation Limited, representing the Consortium in all matters before Maharashtra Metro Rail Corporation Limited, and generally dealing with Maharashtra Metro Rail Corporation Limited and/or any other authority in all matters in connection with Consortium's Bid, till completion of the bidding process in accordance with the Bidding Documents and further till the Contract is entered into with Maharashtra Metro Rail Corporation Limited and thereafter till the expiry of the Contract.

FURTHER RESOLVED THAT Mr./Ms....., (insert the name and designation of the concerned official of the Company) be and is hereby authorized to take all the steps required to be taken by the Company for submission of the **JV/Consortium's** Bid, including in particular, signing the Bid, making changes thereto and submitting amended Bid, signing and executing all the documents related to the Bid, certified copy of this Board resolution or letter or undertakings, etc., required to be submitted to Maharashtra Metro Rail Corporation Limited as part of the Bid or such other documents as may be necessary in this regard and to do in the name and on behalf the **JV/Consortium** all or any of the acts, deeds or things necessary or incidental to submission of said Bid including signing and executing the Contract Documents, making representations to Maharashtra Metro Rail Corporation Limited or any other authority, and providing information / responses to Maharashtra Metro Rail Corporation Limited, representing the **JV/Consortium** in all matters before Maharashtra Metro Rail Corporation Limited, and generally dealing with Maharashtra Metro Rail Corporation Limited in all matters in connection with our Bid till the completion of the bidding process as per the terms of the above said Bidding Documents and further till the Contract is entered into with the Company and thereafter till the expiry of the Contract.

FURTHER RESOLVED THAT a power of attorney as per the draft attached to the Bidding Documents be issued in favour of the above named person, \_\_\_\_\_, to be executed by Mr. \_\_\_\_\_ or Mr. \_\_\_\_\_, Directors of the Company under the Common seal of the Company, affixation thereof to be witnessed by one or both of the above named Directors and by Mr. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) or as per the Memorandum and Articles of Association of the Company.

Signature and stamp of Company Secretary / Managing Director/Directors of Bidding entity

**Notes:**

1. This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Managing Director/Directors of the Bidding Entity.
2. The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.
3. In the event the Board resolution is from a company incorporated outside India, the same needs to be notarized by a notary in the home country of company passing the resolution and legalized by the Indian Embassy there. However, in case such company is from a country which has signed The Hague Legislation Convention 1961, then the Board Resolution is not required to be legalized by the Indian Embassy if it carries a conforming Apostille certificate.

4. This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.

**(C) Format for the Board resolution to be passed by a Member other than the Lead Member of JV/Consortium (applicable in case the Bidder is a JV/Consortium)**

The Board, after discussion, at the duly convened Meeting on ..... (Insert date), with the consent of all the Directors present and in compliance of the provisions of the Companies Act, 1956, passed the following Resolution:

RESOLVED THAT pursuant to the applicable provisions of the Companies Act, 1956 and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to submit a Bid in response to the Bidding Documents dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited (Maharashtra Metro Rail Corporation Limited) for '.....' [name of the work] for Maharashtra Metro Rail Corporation Limited in **JV/Consortium** with \_\_\_\_\_ (insert the name and address of the other **JV/Consortium** members).

FURTHER RESOLVED THAT pursuant to the applicable provisions of the Companies Act, 1956 and as permitted under the Memorandum and Articles of Association of the Company, approval of the Board be and is hereby accorded to execute a **JV/Consortium** Agreement as per the format annexed to the aforesaid Bidding Documents with \_\_\_\_\_ (insert the name and address of the other **JV/Consortium** members).

FURTHER RESOLVED THAT approval of the Board be and is hereby accorded to constitute, appoint and authorize \_\_\_\_\_ (name and registered office address of the **Lead Member**), which is one of the Members of the **JV/Consortium**, to act as the **Lead Member** of the aforesaid **JV/Consortium** and also as true and lawful attorney, to do in the name and on behalf of the **JV/Consortium**, all such acts, deeds and things necessary in connection with or incidental to submission of **JV/Consortium's** Bid in response to the Bidding Documents dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited for '.....' [name of the work] including signing and submission of the Bid and all documents related to the Bid as specified in the Bidding Documents, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document, which Maharashtra Metro Rail Corporation Limited may require us to submit and carrying out the Contract and doing all necessary deeds and things as may be required in respect of the above and also for making representations to Maharashtra Metro Rail Corporation Limited and providing information / responses to Maharashtra Metro Rail Corporation Limited, representing the **JV/Consortium** in all matters before Maharashtra Metro Rail Corporation Limited, and generally dealing with Maharashtra Metro Rail Corporation Limited and/or any other authority in all matters in connection with our Bid, till completion of the bidding process in accordance with the Bidding Documents and further till the Contract is entered into with Maharashtra Metro Rail Corporation Limited and thereafter till the expiry of the Contract.

FURTHER RESOLVED THAT a power of attorney as per the draft attached to the Bidding Documents be issued in favour of the above said Lead Member, \_\_\_\_\_, to be executed

by Mr. \_\_\_\_\_ or Mr. \_\_\_\_\_, Directors of the Company under the Common seal of the Company, affixation thereof to be witnessed by one or both of the above named Directors and by Mr. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) or as per the Memorandum and Articles of Association of the Company.

FURTHER RESOLVED THAT a power of attorney as per the draft attached to the Bidding Documents be issued in favour of Mr./Ms. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) to be executed by Mr. \_\_\_\_\_ or Mr. \_\_\_\_\_, Directors of the Company under the Common seal of the Company, affixation thereof to be witnessed by one or both of the above named Directors and by Mr. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) or as per the Memorandum and Articles of Association of the Company.

FURTHER RESOLVED THAT Mr./Ms. \_\_\_\_\_, (insert the name and designation of the concerned official of the Company) be and is hereby authorized to take all the steps required to be taken by the Company for submission of the aforesaid Bid, including in particular, signing and executing all the documents related to the Bid, certified copy of this Board resolution or letter or undertakings, etc., required to be submitted to Maharashtra Metro Rail Corporation Limited as part of the Bid or such other documents as may be necessary in this regard and to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to give effect to this resolution.

Signature and stamp of Company Secretary / Managing Director/Directors of Bidding Entity

**Notes:**

1. This certified true copy should be submitted on the letterhead of the Company, signed by the Company Secretary / Managing Director/Director of the Bidder.
2. The contents of the format may be suitably re-worded indicating the identity of the entity passing the resolution.
3. In the event the Board resolution is from a company incorporated outside India, the same needs to be notarized by a notary in the home country of company passing the resolution and legalized by the Indian Embassy there. However, in case such company is from a country which has signed The Hague Legislation Convention 1961, then the Board Resolution is not required to be legalized by the Indian Embassy if it carries a conforming Apostille certificate.
4. This format may be modified only to the limited extent required to comply with the local regulations and laws applicable to a foreign entity submitting this resolution. For example, reference to Companies Act 1956 may be suitably modified to refer to the law applicable to the entity submitting the resolution. However, in such case, the foreign entity shall submit an unqualified opinion issued by the legal counsel of such foreign entity, stating that the Board resolutions are in compliance with the applicable laws of the respective jurisdictions of the issuing company and the authorizations granted therein are true and valid.

**(D) Power of Attorney to be provided by each of the Members of the JV/Consortium (other than the Lead Member) in favour of the Lead Member of Bidding Entity**

WHEREAS Maharashtra Metro Rail Corporation Limited, (the Company) has issued the Bidding Documents on \_\_\_\_\_ / Tender No. for inviting Bids for '.....' [name of the work] for

Maharashtra Metro Rail Corporation Limited on the terms and contained in the Bidding Documents;

AND WHEREAS ..... and ..... (Insert names of all Members of Consortium) the Members of the Consortium are desirous of submitting a Bid in response to the Bidding Documents, and if selected, undertaking the responsibility of '***Insert the name of the work***' as per the terms of the Bidding Documents;

AND WHEREAS all the Members of the **JV/Consortium** have agreed under the **JV/Consortium** Agreement dated ..... entered into between all the Members and submitted along with the Bid to appoint ..... (Insert the name and address of the Lead Member) as Lead Member to represent all the Members of the **JV/Consortium** for all matters regarding the Bidding Documents and the Bid;

AND WHEREAS pursuant to the terms of the Bidding Documents and the **JV/Consortium** Agreement, we, the Members of the **JV/Consortium** hereby designate M/s ..... (Insert name of the Lead Member) as the Lead Member to represent us in all matters regarding the Bid and the Bidding Documents, in the manner stated below:-

Know all men by these presents, We ..... (Insert name and address of the registered office of the Member-1), ..... (Insert name and address of the registered office of the Member-2) ..... (Insert name and address of the registered office of the Member-n) do hereby constitute, appoint and authorize ..... (name and registered office address of the Lead Member), which is one of the Members of the **JV/Consortium**, to act as the **Lead Member** and our true and lawful attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to submission of JV/Consortium's Bid in response to the *Bidding Document dated / Tender No \_\_\_\_\_* issued by the Company for '***.....***' [***name of the work***] including signing and submission of the Bid and all documents related to the Bid as specified in the Bidding Documents, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document, which the Company may require us to submit and carrying out the Contract and doing all necessary deeds and things as may be required in respect of the above. The aforesaid Attorney shall be further authorized for making representations to the Company named in the Bidding Documents, and providing information / responses to the Company named in the Bidding Documents, representing us and the **JV/Consortium** in all matters before the Company named in the Bidding Documents, and generally dealing with the Company named in the Bidding Documents and/or any other authority in all matters in connection with our Bid, till completion of the bidding process in accordance with the Bidding Documents and further till the Contract is entered into with the Company and thereafter till the expiry of the Contract.

We, as Members of the Consortium, hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms in the Bidding Documents.

Signed by the within named  
.....[Insert the name of the executant company]  
through the hand of

Mr. ....  
(duly authorized by the Board to issue such Power of Attorney

Signature of Executant

Dated this ..... day of .....

Accepted

.....  
Signature of Attorney  
(Name, designation and address of the Attorney)

Attested

.....  
(Signature of the executant)  
(Name, designation and address of the executant)

.....  
Signature and stamp of Notary of the place of execution

Common seal of ..... has been affixed in my/our presence pursuant to Board of Director's Resolution dated.....

WITNESS:

1. ....  
(Signature)  
  
Name .....  
  
Designation.....
2. ....  
(Signature)  
  
Name .....  
  
Designation.....

**Notes:**

1. The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.
2. In the event, power of attorney has been executed outside India, the same needs to be notarized by a notary in the home country of company executing this power of attorney and legalized by the Indian Embassy there. However, in case such company is from a country which has signed The Hague Legislation Convention 1961, then the said power of attorney is not required to be legalized by the Indian Embassy if it carries a conforming Apostille certificate.
3. Also, wherever required, the executant(s) should submit for verification the extract of the chartered documents and documents such as a Board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).





**(E) Format for PoA for Lead Member of JV/Consortium  
POWER OF ATTORNEY**

*(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution and notarised with Notary Public. Foreign companies submitting Bids are required to follow the applicable law in their country)*

Power of Attorney to be provided by the Bidder Company/ **Lead Member** in favour of its representative as evidence of authorized signatory's authority.

Know all men by these presents, We .....(name and address of the registered office of the Bidding Company or Lead Member of the Bidding **JV/Consortium**, as applicable) do hereby constitute, appoint and authorize Mr./Ms.....(name and residential address) who is presently employed with us and holding the position of \_\_\_\_\_, as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to submission of our Bid for '.....' [name of the work] for Maharashtra Metro Rail Corporation Limited in response to the Bidding Document dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited (Maharashtra Metro Rail Corporation Limited) (the Company) including signing and submission of the Bid and all other documents related to the bidding, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the Company may require us to submit the bid and also signing and executing the Contract Documents. The aforesaid Attorney is further authorized for making representations to the Company or any other authority, and providing information / responses to the Company, representing us in all matters before the Company, and generally dealing with the Company in all matters in connection with our Bid till the completion of the bidding process as per the terms of the Bidding Documents and further till the Contract is entered into with the Company and thereafter till the expiry of the Contract.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

(Add in the case of a **JV/Consortium**)

Our firm is a Member/Lead member of the **JV/Consortium** of \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_

All the terms used herein but not defined shall have the meaning ascribed to such terms under the Bidding Documents.

Signed by the within named  
.....[Insert the name of the executant company]  
through the hand of  
Mr. ....  
duly authorized by the Board to issue such Power of Attorney  
Signature of Executant of POA

Dated this ..... day of .....

Accepted

.....  
Signature of Attorney  
(Name, designation and address of the Attorney)

Attested  
.....  
(Signature of the executant)

(Name, designation and address of the executant)

.....  
Signature and stamp of Notary of the place of execution

Common seal of ..... has been affixed in my/our presence pursuant to Board of Director's Resolution dated.....

**WITNESS**

1. ....  
(Signature)

Name .....

Designation.....

2. ....  
(Signature)

Name .....

Designation.....

**Notes:**

1. The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.
2. In the event, power of attorney has been executed outside India, the same needs to be duly notarized by a notary public of the jurisdiction where it is executed.
3. Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

**(F) Format for PoA for Other Member(s)**  
**POWER OF ATTORNEY**

*(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution and notarised with Notary Public . Foreign companies submitting Bids are required to follow the applicable law in their country)*

Power of Attorney to be provided by **each Member** other than the **Lead Member** in favor of its representative as evidence of authorized signatory's authority. (Applicable to **JV/Consortium** only)

Know all men by these presents, We .....(name and address of the registered office of the Member of the **JV/Consortium**, as applicable) do hereby constitute, appoint and authorize Mr./Ms.....(name and residential address) who is presently employed with us and holding the position of \_\_\_\_\_, as our Attorney to sign bid document and execute the Contract Agreement and any other requisite document in our name and our behalf for *Tender No.'.....' [name of the work]* for Maharashtra Metro Rail Corporation Limited in response to the Bidding Document dated \_\_\_\_\_ issued by Maharashtra Metro Rail Corporation Limited (Maharashtra Metro Rail Corporation Limited) (the Company) and to do all or any of the acts, deeds or things necessary or incidental to the above.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

(Add in the case of a Consortium)

Our firm is a Member of the Consortium of \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_

All the terms used herein but not defined shall have the meaning ascribed to such terms under the Bidding Documents.

Signed by the within named

.....[Insert the name of the executant company]

through the hand of

Mr. ....

Signature of executant

duly authorized by the Board to issue such Power of Attorney (As per board resolution)

Dated this ..... day of .....

Accepted

.....

Signature of Attorney

(Name, designation and address of the Attorney)

Attested

.....

(Signature of the executant)

(Name, designation and address of the executant)

.....

Signature and stamp of Notary of the place of execution

Common seal of ..... has been affixed in my/our presence pursuant to Board of Director's Resolution dated.....

**WITNESS**

1. ....  
(Signature)

Name .....

Designation.....

2. ....  
(Signature)

Name .....

Designation.....

**Notes:**

1. The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.
2. In the event, power of attorney has been executed outside India, the same needs to be duly notarized by a notary public of the jurisdiction where it is executed.
3. Also, wherever required, the executant(s) should submit for verification the extract of the charter documents and documents such as a board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).

**Letter of Undertaking Regarding Confidentiality of Bid Information**

(This document is to be prepared by the Bidder and submitted on Bidder's Letterhead as part of Technical Package as per BDS 26.4)

**To:****Date:** .....

THE MANAGING DIRECTOR,  
Maharashtra Metro Rail Corporation Limited  
Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005,  
Maharashtra, INDIA

**Ref:-**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

We (Name of Bidder / Consortium) hereby undertake that the Bid drawings, both in hard copy and digitized format, and the Bidding documents purchased as a necessary part of our preparation of this Bid shall be used solely for the preparation of the Bid and that if the Bid is successful, shall be used solely for the execution of Works.

We further undertake that the aforesaid Bid drawings and documents prepared by Maharashtra Metro Rail Corporation Limited, shall not be used in whole, in part or in any altered form on any other project, scheme, design or proposal that the Bidder / Consortium / Members of Consortium or its/their parent companies or sub-contractors of the Bidder / Consortium are, or will be involved with either in India or in any other Country.

Signed: .....

For and on behalf of

(Name of Bidder / Joint Venture / Consortium)

(To be signed by each member of the Joint Venture / Consortium, as applicable)

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member.

**Undertaking for Downloaded Bidding Documents**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

We hereby confirm that, we have downloaded the complete set of Bid Documents along with the set of enclosures hosted in e-tendering portal <https://mahametrorail.etenders.in>.

We confirm that the Bidding Documents has not been edited or modified by us. In case, it is observed by Maharashtra Metro Rail Corporation Limited that the Bidding Documents have been edited or modified, we agree for the rejection of our Bid by Maharashtra Metro Rail Corporation Limited.

Company name .....

Name .....

Signature .....

Address of correspondence .....

E-mail ID .....

Phone Fax .....

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member.

**Form-27****Form of Certificate confirming submission of all documents of Financial Package in the Technical Package with prices left blank**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

1. This is to certify that the copy of all the documents of Financial Package, submitted with the Technical Package, is a true Copy of the Financial Package with prices left blank.
2. It is further certified that there are no additional comments, remarks, deviations, terms and conditions in our Financial Package and even if it is there, it shall be treated as NULL and VOID and stand withdrawn.

**SIGNATURE OF BIDDER**

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member.

**Form-28****Form of Certificate confirming downloading of all Bidding Documents, Corrigendum and Addendum**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

This is to certify that we, M/s \_\_\_\_\_ [\* Name of the Bidder] have downloaded all Bidding Documents, Corrigendum, Clarifications and Addenda for Contract No. \_\_\_\_\_ as listed below:

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

**SIGNATURE OF BIDDER**

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member.



**Form of Declaration for non-engagement of any agent, middleman or intermediary**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

[We hereby declare / We hereby jointly and severally]@ declare that the submission of this Bid 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 Bid price does not include any such amount. We acknowledge the right of the Employer, if it finds to the contrary, to declare our Bid to be non-compliant and if the Contract has been awarded to declare the Contract NULL and VOID.

**SIGNATURE OF THE BIDDER**

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member

Form No.30

**Form of certificate confirming careful examination of all the contents of Bidding Documents  
and signing of all pages of Bidder's proposal**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

This is to certify that we, M/s \_\_\_\_\_ [\*Name of the company/JV/Consortium] have carefully examined all the contents of the Bidding Documents including Addenda (if any) and all the pages of our proposal have been signed and stamped by our authorized signatory.®.

SIGNATURE OF BIDDER

\*\*In case of a joint venture or Consortium, such pages to be signed by authorized signatory of the Lead member.

**Undertaking for passing on benefits of exemptions to Maharashtra Metro Rail Corporation Limited and for adjustment of amounts due from balance due**

(To be submitted on Bidder's Letterhead)

Dated:.....

**Letter of Undertaking**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

I \_\_\_\_\_ (State Name of Director/Partner/ Karta/Authorized Person) in capacity of \_\_\_\_\_ of \_\_\_\_\_ (State name of the undertaking organization) here by undertake to reimburse / pass on benefit of any duty draw back / export, import incentive / exemption / concession / benefit etc. obtained for the Maharashtra Metro Rail Corporation Limited project to Maharashtra Metro Rail Corporation Limited. I will maintain proper records as required by Maharashtra Metro Rail Corporation Limited and relevant statute. I will furnish such records to Maharashtra Metro Rail Corporation Limited as and when required by them.

I agree to adjustment of any benefits/ duty draw back / export, import incentive / exemptions / concessions to be made from the balance due to me without any prejudice.

I also undertake to indemnify Maharashtra Metro Rail Corporation Limited in case of any loss caused due to non-reimbursement / passing on the benefit of duty draw back / export, import incentive / exemption / concession etc.

I state that everything declared by me is true and correct to my belief.

Signed.....

For on behalf of

(Name of Bidder / Consortium)

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member

**Undertaking for obtaining registrations under various fiscal and labour laws**

(To be submitted on Bidder's Letterhead)

Dated:.....

**Letter of Undertaking**

Bidder's Name: \_\_\_\_\_

Tender No. : \_\_\_\_\_

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

I \_\_\_\_\_ (State Name of Director/Partner /Authorized Person) in capacity of \_\_\_\_\_ of \_\_\_\_\_ (State name of the undertaking organization) here by undertake to get registered under \_\_\_\_\_ (state the type of registration to be obtained) before \_\_\_\_\_ (state time line) (preferably immediately after award of Contract).

I also undertake to indemnify Maharashtra Metro Rail Corporation Limited in case of any loss caused due to non-registration.

I state that everything declared by me is true and correct to my belief.

Signed.....

For on behalf of

(Name of Bidder / Consortium)

\* In case of a JV/Consortium, to be submitted by the Authorized representative of the Lead Member

**Deleted**

**Bid Securing Declaration****[Applicable if EMD/ Bid Security exemption is availed by Bidder as per BDS/ ITB Clause No. 19.1]**

Dt. \_\_\_\_/\_\_\_\_/\_\_\_\_

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

To,

**Maharashtra Metro Rail Corporation Ltd (Maha-Metro)**, hereinafter called "the **Employer**" acting through Executive Director (Procurement), Maharashtra Metro Rail Corporation Ltd Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005, MAHARASHTRA, INDIA

We, the undersigned, declare that:

We understand that, according to your conditions, Bids must be supported by a Bid-Securing Declaration. We accept that we will automatically be suspended from being eligible for bidding in any contract with the Borrower for the period of time of **05 (Five) Years** starting on the date that we receive a notification from the Employer, if we are in breach of our obligation(s) under the bid conditions, because we

- (a) have withdrawn our Bid during the period of bid validity specified in the Letter of Bid; or
- (b) do not accept the correction of errors in accordance with the Instructions to Bidders (hereinafter "the ITB"); or
- (c) having been notified of the acceptance of our Bid by the Employer during the period of bid validity, (i) fail or refuse to execute the Contract, if required; or (ii) fail or refuse to furnish the Performance Security, in accordance with the ITB; or (iii) fail or refuse to furnish a domestic preference security, if required.

We understand that this Bid-Securing Declaration shall expire if we are not the successful Bidder, upon the earlier of (i) our receipt of your notification to us of the name of the successful Bidder; or (ii) 28 days after the issue of LOA (Letter of Acceptance) in favour of successful bidder. .

**Signed:** . . . . . [insert signature of person whose name and capacity are shown] . . . . .

In the capacity of . . . . . [insert legal capacity of person signing the Bid-Securing Declaration] . .

Name: . . . . . [insert complete name of person signing the Bid-Securing Declaration] . . . . .

Duly authorized to sign the bid for and on behalf of . . . . . [insert complete name of the bidder] . . . . .

Dated on \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_ [insert date of signing]

Corporate Seal . . . . . [where appropriate] . . . . .

*Note: Relevant Copy of certificate of MSME registration shall be enclosed by bidder*

**Format-35****Format for Power of Attorney**

*(Applicable if bidder is a Partnership firm/ Private limited company /Limited company and participating as sole / single entity bidder)*

*(To be on non-judicial stamp paper of appropriate value as per Stamp Act relevant to place of execution. Foreign companies submitting Bid are required to follow the applicable law in their country)*

(Power of Attorney to be provided by the Bidder Company/ Bidder in favour of its representative as evidence of authorized signatory's authority)

Know all men by these presents, we ..... (Name and address of the registered office of the Bidding Company or Bidder) do hereby constitute, appoint and authorize Mr./Ms.....S/o..... (name and residential address) who is presently employed with us and holding the position of ..... as our Attorney to do in our name and our behalf all or any of the acts, deeds or things necessary or incidental to submission of our Bid for '.....' [Name of the work] for Pune Metro Rail Project of Maha-Metro in response to the Bid (Tender No.) .....issued by Maharashtra Metro Rail Corporation Limited (the Employer) including signing and submission of the Bid and all other document related to the bidding, including but not limited to undertakings, letters, certificates, acceptances, clarifications, guarantees or any other document which the Company may require us to submit and also signing and executing the Contract Document. The aforesaid Attorney is further authorized for making representations to the Company or any other authority, and providing information / responses to the Company, representing us in all matters before the Company, and generally dealing with the Company in all matters in connection with our Bid till the completion of the bidding process as per the terms of the Bidding Document and further till the Contract is entered into with the Company and thereafter till the expiry of the Contract.

We hereby agree to ratify all acts, deeds and things done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall be binding on us and shall always be deemed to have been done by us.

All the terms used herein but not defined shall have the meaning ascribed to such terms under the Bidding Document.

Signed by the within named [Insert the name of the Firm/company/bidding entity] through the hand of

**Mr.....**

**Name of the Executant)**

Duly authorized by the Board to issue such Power of Attorney by board resolution Dt.....

(Copy enclosed

Dated this \_\_\_\_\_ day of Accepted.....

\_\_\_\_\_  
**Signature of the POA holder)**

**(Name, designation and address of the POA holder)**

Attested

.....  
(Signature & Seal / stamp of the executant )  
(Name, designation and address of the executant)

.....  
Signature and stamp of Notary of the place of execution

Common seal of has been affixed in my/our presence pursuant to Board of Director's Resolution dated.....

WITNESS:

1. (Signature) Name Designation
2. (Signature) Name Designation

**Notes:**

1. The mode of execution of the power of attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter document of the executant(s) and the same should be under common seal of the executant affixed in accordance with the applicable procedure. Further, the person whose signatures are to be provided on the power of attorney shall be duly authorized by the executant(s) in this regard.
2. In the event, power of attorney has been executed outside India, the same needs to be duly notarized by a notary public of the jurisdiction where it is executed.
3. Also, wherever required, the executant(s) should submit for verification the extract of the charter document and document such as a board resolution / power of attorney, in favour of the person executing this power of attorney for delegation of power hereunder on behalf of the executant(s).



**UNDERTAKING OF AUTHORIZED SIGNATORY****(If bidder is sole & Proprietorship firm)***(To be typed on INR: 100 Stamp Paper & notarized by Notary Public)*

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

1. I, \_\_\_\_\_ Son/Daughter of Shri. \_\_\_\_\_ Proprietor of M/s \_\_\_\_\_ competent to sign the declaration and execute this bid and agreement in event of award.
2. I have carefully read and understood all the terms and conditions of the tender which are fully acceptable to me.
3. The information / documents furnished along with the above tender are true and authentic to the best of my knowledge and belief. I/we, am/ are well aware of the fact that furnishing of any false information/fabricated document would lead to rejection of my tender & forfeiture of my Bid Security /EMD besides liabilities towards prosecution under appropriate law.

(Signature of Proprietor)

Full Name:

Date:

Place:

Seal:

Signature &amp; Seal of Notary Public

Note:

1. The above declaration shall be notarized by notary public

**Form No.-37****Bid Index**

Bidder's Name:- \_\_\_\_\_

Tender No.: \_\_\_\_\_

Name of Work: \_\_\_\_\_

The Bidder shall include with its Bid an index which cross refers all of the Employer's bidding requirements elaborated in these documents to all the individual sections within Package 1: Technical Package and Package 2: Financial Package which the Bidder intends to be the responses to each and every one of those requirements.

The Packages submitted must be clearly presented, all pages numbered and laid out in a logical sequence with main and subheadings to facilitate evaluation.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**

**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**PART 1: BIDDING PROCEDURE**

**SECTION V: ELIGIBILITY CRITERIA AND  
SOCIAL AND ENVIRONMENTAL  
RESPONSIBILITY**



**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005,  
Maharashtra, INDIA

Tel- 020-7410004067/68,

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Section-V: Eligibility Criteria and Social and Environmental Responsibility****Eligibility in Maha-Metro/Agency-Financed Procurement**

1. To the exception of any equipment or any sector, which is subject to an embargo by the United Nations or the European Union, all goods and services are eligible for Maha-Metro/ EIB financing regardless of the country of origin of the supplier, contractor, provider or sub-contractors, inputs or resources used in the implementation processes.
2. Natural or legal persons (including all members of a joint venture or any of their subcontractors) shall not be awarded an Maha-Metro/Agency-financed contract if, on the date of submission of an application or of a bid or on the date of award of a contract, they:
  - a) where the Bidder is bankrupt or is the subject of insolvency or winding up proceedings, where its assets are being administered by a liquidator or by the court, where it is in an arrangement with creditors, where its business activities are suspended or it is in any analogous situation arising from a similar procedure under national laws and regulations;
  - b) Bidders have not fulfilled their obligations regarding the payment of social security contributions or taxes in accordance with the legal provisions of the country where they are established or the Employer 's country;
  - c) where the Employer can demonstrate by any appropriate means a violation by the Bidder of applicable obligations in the fields of environmental, social and labour law established by national law, collective agreements or by the international environmental, social and labour law provisions;
  - d) where the Employer has sufficiently plausible indications to conclude that the Bidder has entered into agreements with other Bidder(s) aimed at distorting competition;
  - e) where the Bidder has shown significant or persistent deficiencies in the performance of a substantive requirement under a prior public contract, a prior contract with the Employer or a prior concession contract which led to early termination of that prior contract, damages or other comparable sanctions;
  - f) Bidders have been convicted within the past five years by a court decision, which has the force of residential jurisdiction in the country where the project is implemented, of fraud or corruption or any other Prohibited Conduct (as defined in the Covenant of Integrity) committed during the procurement or performance of a contract, unless they provide supporting information together with their Covenant of Integrity which shows that this conviction is not relevant in the context of this project;
  - g) Bidder is listed for financial sanctions by the United Nations and/or the European Union for the purposes of fight against terrorist financing or threat to international peace and security;

- h) Bidder including JV Partners should be excluded by the EU Institutions or any major Multilateral Development Bank (including World Bank Group, African Development Bank, Asian Infrastructure Investment Bank, Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank or Inter-American Development Bank) from participation in a tendering procedure on the grounds of Prohibited Conduct;
  - i) where the Employer can demonstrate by appropriate means that the Bidder is guilty of grave professional misconduct, which renders its integrity questionable;
  - j) where a conflict of interest within the meaning of Clause 4.2 of ITB cannot be effectively remedied by other less intrusive measures;
  - k) where a distortion of competition from the prior involvement of the Bidder in the preparation of the procurement procedure, as referred to in Section VI: Agency Policy – Corrupt and Fraudulent Practices of the Bid Document Part-1, cannot be remedied by other, less intrusive measures;
  - l) where the Bidder has been guilty of serious misrepresentation in supplying the information required for the verification of the absence of grounds for exclusion or the fulfilment of the selection criteria, has withheld such information or is not able to submit the supporting documents required pursuant to Clause 27 of ITB; or
  - m) where the Bidder has undertaken to unduly influence the decision making process of the Employer, to obtain confidential information that may confer upon it undue advantages in the procurement procedure or to negligently provide misleading information that may have a material influence on decisions concerning exclusion, selection or award.
  - n) have committed misrepresentation in documentation requested by the Employer as part of the contract procurement procedure;
3. Bidders that are Government-owned enterprises or institutions may participate only if they can establish that they (i) are legally and financially autonomous (ii) operate under commercial law. To be eligible, a government-owned enterprise or institution shall establish to the Agency's satisfaction, through all relevant documents, including its Charter and other information the Agency may request, that it: (i) is a legal entity separate from their government (ii) does not currently receive substantial subsidies or budget support; (iii) operates like any commercial enterprise, and, inter alia, is not obliged to pass on its surplus to their government, can acquire rights and liabilities, borrow funds and be liable for repayment of its debts, and can be declared bankrupt.
4. In order to promote sustainable development, Maha-Metro/Agency seeks to ensure that internationally recognised environmental and social standards are complied with. Candidates for Maha-Metro/Agency-financed contracts shall consequently undertake in the Statement of Integrity to:

- i) comply with and ensure that all their subcontractors comply with international environmental and labour standards, consistent with applicable law and regulations in the country of implementation of the Project, including the fundamental conventions of the International Labour Organisation (ILO) and international environmental treaties;
- ii) adopt any environmental and social risk mitigations measures as defined in the environmental and social management plan or in the environmental and social impact notice issued by the Employer.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**

**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**PART 1: BIDDING PROCEDURE  
SECTION VI: AGENCY POLICY – CORRUPT  
AND FRAUDULENT PRACTICES**



**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005,

Maharashtra, INDIA

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

## Section VI. Agency Policy - Corrupt and Fraudulent Practices

In pursuance of the Funding Agency's (EIB's) Anti-Fraud Policy (refer to <http://www.eib.org/en/infocentre/publications/all/anti-fraud-policy.htm>), Prohibited Conduct includes corruption, fraud, coercion, collusion, obstruction, money laundering and financing of terrorism defined as follows:

- a) A corrupt practice, is the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party.
- b) A fraudulent practice, is any act or omission, including a misrepresentation that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation.
- c) A coercive practice, is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party.
- d) A collusive practice, is an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.
- e) An obstructive practice is (a) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or (b) acts intended to materially impede the exercise of the EIB's contractual rights of audit or access to information or the rights that any banking, regulatory or examining authority or other equivalent body of the European Union or of its Member States may have in accordance with any law, regulation or treaty or pursuant to any agreement into which the EIB has entered in order to implement such law, regulation or treaty.
- f) Money laundering is,
  - i. the conversion or transfer of property, knowing that such property is derived from criminal activity or from an act of participation in such activity, for the purpose of concealing or disguising the illicit origin of the property or of assisting any person who is involved in the commission of such activity to evade the legal consequences of his action;
  - ii. the concealment or disguise of the true nature, source, location, disposition, movement, rights with respect to, or ownership of property, knowing that such property is derived from criminal activity or from an act of participation in such activity;
  - iii. the acquisition, possession or use of property, knowing, at the time of receipt, that such property was derived from criminal activity or from an act of participation in such activity;



- iv. participation in, association to commit, attempts to commit and aiding, abetting, facilitating and counselling the commission of any of the actions mentioned in the foregoing points.

g) Financing of terrorism is the provision or collection of funds, by any means, directly or indirectly, with the intention that they should be used or in the knowledge that they are to be used, in full or in part, to commit, or to contribute to the commission of any of the offences within the meaning of Articles 3 to 10 of Directive (EU) 2017/541 of 15 March 2017 on combating terrorism. Where the financing of terrorism concerns any of the offences laid down in Articles 3, 4 and 9 of Directive (EU) 2017/541, it shall not be necessary that the funds be in fact used, in full or in part, to commit, or to contribute to the commission of any of those offences, nor shall it be required that the offender knows for which specific offence or offences the funds are to be used.

The Employer will declare a firm ineligible, either indefinitely or for a stated period of time, for any Employer's contract, if at any time determines that the firm has engaged in Prohibited Conduct in competing for, or in executing, a borrowed financed contract in general.

The Tenderer/Contractor grant the Employer, the Funding Agencies and auditors appointed by either of them, as well as any authority or European Union Institution or body having competence under European Union law, the right to inspect and copy the books and records of the tenderer, contractor, supplier or consultant.

If it is established to the required standards that a project-related party has engaged in Prohibited Conduct in the course of a procurement process or implementation of a contract to be financed, the Funding Agency:

- a) may seek appropriate remediation of the Prohibited Conduct to its satisfaction;
- b) may declare ineligible such project-related party to be awarded the contract; and/or
- c) may withhold the Funding Agency's no objection to contract award and may apply appropriate contractual remedies, which may include suspension and cancellation, unless the Prohibited Conduct has been dealt with to the satisfaction of the Funding Agency.

Furthermore, within the framework of the Funding Agency's Exclusion Policy (see the EIB's Exclusion Policy: <https://www.eib.org/en/publications/exclusion-policy.htm>), the Funding Agency may declare such project related party ineligible to be awarded a contract under any EIB project or to enter into any relationship with the Funding Agency.

It should be noted that, in the Covenant of Integrity, the tenderer is requested to self-declare all sanctions and / or exclusions (including any similar decisions having the effect of imposing conditions on the tenderer or its subsidiaries or to exclude the said tenderer or its subsidiaries, such as temporary suspension, conditional non-exclusion, etc.) imposed by the European institutions or any multilateral development banks (including the World Bank Group, the African Development Bank, the Asian Development Bank, European Bank for Reconstruction and Development, European Investment Bank or Inter-American Development Bank), regardless of the date of issue and the expiration or not of such decisions and of the current status of any sanction and / or exclusion. In this regard, any omission or misrepresentation, made knowingly or recklessly, may be considered as fraud under the EIB Anti-Fraud Policy. Therefore, the Employer reserves the right to reject any offer presenting an inaccurate or

incomplete Covenant of Integrity, and may cause the rejection of the offer for prohibited conduct.”

**MAHARASHTRA METRO RAIL CORPORATION LIMITED  
(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**

**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**PART-2: WORK REQUIREMENT**



**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Part-2 - Work Requirement**

- |                     |  |
|---------------------|--|
| 1) Section-VII-A    | Employer's Requirements - General                          |
| 2) Section-VII-B    | Employer's Requirements –Functional-Deleted                |
| 3) Section-VII-C    | Employer's Requirements –Design-Deleted                    |
| 4) Section-VII-D    | Employer's Requirements - Construction                     |
| 5) Section-VII-E    | Employer's Requirements -General Planning Criteria-Deleted |
| 6) Section-VII-F    | Technical Specification (Structural)                       |
| 7) Annexure-VII-3   | Appendices`  |
| 8) Annexure-VII-4   | DBR - Elevated Stations- Deleted                           |
| 9) Annexure-VII-5   | DBR - Viaduct - Deleted                                    |
| 10) Annexure-VII-6  | Interface Matrix- Deleted                                  |
| 11) Annexure-VII-7  | Schedule of Dimensions - Deleted                           |
| 12) Annexure-VII-8  | Design Requirement- Deleted                                |
| 13) Annexure-VII-9  | Reference Drawings- Deleted                                |
| 14) Annexure-VII-10 | IT Requirement- Deleted                                    |

**SECTION-VII-A****EMPLOYER'S REQUIREMENTS – GENERAL**Scope of Work**1) Construction of open O&M Store for spare material at Range Hill:**

1800 sqm. of open area to be developed for O&M store for spare materials. The broad scope of works includes:

- a) Preparation of subgrade
- b) GSB laying & leveling with compaction.
- c) Closing all side edges with kerb stones
- d) Side closing of open area by fixing PEB/MS columns (box section) with foundation at periphery.
- e) Chain-link fencing along with barbed & concertina wire at top
- f) Preparation of 30 Rmt RCC ramp at entrance
- g) Providing adequate lighting and allied electrical works.
- h) Any other miscellaneous work assigned by Maha-Metro

All the items to be operated for above scope of work shall be as per latest available CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR.

**2) Construction of Shivaji Nagar MSRTC Bus Stand:**

15700 Sqm. of area to be developed near Shivaji Nagar Metro station for MSRTC Bus Stand. The broad scope of works includes:

- a) Construction of bus stand with all passenger facilities suitable for 20 no's platform to halt bus with PEB/MS columns and roof structure.
- b) Platform construction with preparation of subgrade, GSB laying & leveling with compaction, PCC, kerb stones and Paver block, providing tactile pathway, etc.
- c) Supply & fixing of platform names signages as per directives/drawing of MSRTC.
- d) Construction of facility building for MSRTC staff and passenger.
- e) Providing seating arrangement for public at bus stand.
- f) Providing PQC or Bitumen pathway for bus movement, platform location & parking of buses.
- g) Providing electrical wiring with open conduiting, fixing switch boards, tube lights, fans and required E&M facilities.
- h) Any other miscellaneous work assigned by Maha-Metro

All the items to be operated for above scope of work shall be as per latest available CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR.

**3) Construction of Food grain Godown at Uruli Devachi:**

11352.52 Sqm. of area to be developed for Godown for food grain storage purpose. The broad scope of works includes:

- a) Leveling & subgrade preparation at ground as per given drawing.

- b) Construction of composite structure of PEB/MS & RCC structure along with construction of RCC foundation, fixing PEB/MS columns, closing with PEB truss, rafter and purlin with roof as per given instructions.
- c) Blockwork followed by plaster, putty and painting as per drawing and finishing as per architectural requirement.
- d) Providing electrical wiring with open conduiting, fixing switch boards, tube lights, fans and required E&M facilities.
- e) Closing of all area by providing PEB/MS fencing or blockwork compound wall.
- f) Any other miscellaneous work assigned by Maha-Metro

All the items to be operated for above scope of work shall be as per latest available CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR.

**4) Construction works related to PCMC Nepali Market R&R:**

R&R works of old Nepali Market shops to new market shops already constructed by Maha Metro. The broad scope of works includes:

- a) Providing 20KLD UGT water tank with submersible pumps & plumbing connection for storage of domestic water.
- b) Providing overhead PVC water tanks for toilet water supply.
- c) Providing Water Filter + cooler with RO, UV and UF plus sedimentation tank for drinking water facility.
- d) Construction of compound wall with PEB/MS fencing or Blockwork wall as per drawing.
- e) Providing two entrance roads for new market shop with MS gate.
- f) Providing ACP arch with PEB/MS support column and beam.
- g) Dismantling of old shops and disposal of all materials to the nominated & approved dumping space within vicinity of 5Km.
- h) Minor repair works of false ceiling, switch box, tube light or ceiling fans inside new shops.
- i) Any other miscellaneous work assigned by Maha-Metro

All the items to be operated for above scope of work shall be as per latest available CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR.

**5) Construction works related to Operations and Maintenance at Range Hill Depot:**

Various works in connection with Operations and Maintenance requirements at RH Depot. The broad scope of works includes:

- a) Open space development besides RSS and Signaling office for construction of industrial shed (O&M Stores) including Civil, MEP and PEB works.
- b) Construction of training center including Civil, MEP and supply of furniture at second floor of IWB (Integrated Workshop Building).
- c) Development of office space in first floor of Admin building which includes Civil, MEP, supply and installation of required furniture.
- d) Development of space for store which includes Civil, MEP, supply and installation of industrial racking system at basement of Admin building.
- e) Any other miscellaneous work assigned by Maha-Metro

All the items to be operated for above scope of works shall be as per detailed BOQ enclosed.

**6) Any other miscellaneous work assigned by Maha-Metro officials:**

The work includes any other miscellaneous work assigned by Maha-Metro during the tenure of Contract. The scope includes any works but not limited to, road repair work, building maintenance & repair, parking development work, road signage fixing, chamber fixing, drainage line fixing, plumbing pipe fixing work, E&M related works, painting works, housekeeping & any other work of Maha-Metro office maintenance or new item fixing.

All the items to be operated for above scope of work shall be as per latest available CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR.

**The priority of operating the item billing for scope of works under Sr. Nos. 1 to 4 and 6 shall be as below:**

- 1) Latest available CPWD DSR
- 2) Latest available PMC/PCMC DSR/SSR
- 3) Latest available Maharashtra State PWD SOR

**Note:** All the works shall be carried out as per specifications of respective applicable Schedule of rates (CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR) and work requirements of Maha Metro.

Scope of works under Sr. No. 5 above shall be as per BOQ attached.

**Section VII-F – Technical Specification****S.01: GENERAL****1.1. General:**

- 1.1.1 These Specifications contained herein shall be read in conjunction with other tender documents.
- 1.1.2 The Work shall be carried out in accordance with the "Good for Construction" drawings and designs as would be issued to the Contractor by the Engineer duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications, etc. not bearing Engineer's signature and stamp. Similarly, the Contractor shall not take cognizance of instructions given by any other authority except the instructions given by the Engineer in writing.
- 1.1.3 The work shall be executed and measured as per metric units given in the Schedule of Quantities, drawings etc. (FPS units where indicated are for guidance only) (Not applicable for Viaduct D&B Works).
- 1.1.4 Absence of terms such as providing, supplying, laying, installing, fixing etc. in the descriptions does not even remotely suggest that the Contractor is absolved of such providing, supplying etc. unless an explicit stipulation is made in this contract. The Employer / Owner shall bear no costs of materials, labour, equipment, duties, taxes, royalties etc.
- 1.1.5 The specifications may have been divided into different sections / sub-heads for convenience only. They do not restrict any cross-references. The Contractor shall take into account interrelations between various parts of works/trades. No claim shall be entertained on the basis of compartmental interpretations.
- 1.1.6 The classification of various items of works for purpose of measurements and payments shall be as per schedule of payment. Except where distinguished by BOQ, the rates apply to all heights, depths, sizes, shapes and locations. They also cater for all cuts and wastes. No floor wise separation shall be made for the rates. Likewise, all heights of centring, shuttering, staging, formwork and scaffolding, launching trusses and other launching methods are covered by the rates including multi stage propping for heights greater than one floor as per drawings.
- 1.1.7 Reference to the Standard Codes of Practice:  
The contractor shall make available at site all relevant Codes of practice as applicable.

**Legend:**

ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BS	British Standard
CPWD	Central Public Works Department
DIN	Deutsches Institute for Normunge V.
IRC	Indian Road Congress
IRS	Indian Railway Standards
IS	Indian Standards
JIS	Japanese Industrial Standard
MORTH	Ministry of Road Transport and Highways



**1.1.8 Contractor to Provide:**

The Contractor shall provide and maintain at site throughout the period of works the following at his own cost and without extra charge, Except for the items specified in the Bill of Quantities the cost being held to be included in the Contract Price.

1. General works such as setting out, site clearance before setting out and on completion of works. All weather approach roads to the site office should also be constructed and maintained in good condition.
2. All labour, materials, plant, equipment and temporary works, Overhead charges as well as general liabilities, obligations, insurance and risks arising out of GCC, required for completing and maintaining the works to the satisfaction of the Engineer.
3. Adequate lighting for night work, and also whenever and wherever required by the Engineer.
4. Continuous and rigid temporary fences, barricades, guards, lights and protective work necessary for protection of workmen, supervisors, engineers, general public and any other persons permitted access to the site. Contractor shall provide proper signage's as directed.
5. All fences, barricade shall be painted with colour shades / designs as specified by the Engineer. The barricading should be of adequate height to ensure visual obstruction of work from public view.
6. All equipment, instruments, labour and materials required by the Engineer for checking alignment, levels, slopes and evenness of surfaces measurements and quality etc.
7. Design mixes and testing them as per relevant clauses of specifications giving proportion of ingredients, sources of aggregates and binder along with accompanying trial mixes. Test results to be submitted to the Engineer for his approval before adoption on works.
8. Method Statements, for each main activity of the work (temporary and permanent) to be executed detailing the purpose, scope, resources required, sequence / procedure of execution, persons responsible, time frame, safety requirements & measures, risk analysis, Inspections, and Test Procedures along with standard values / acceptable criteria etc. duly approved by the Engineer before start of that particular activity at site.
9. Contractor shall also prepare / approve and make available to the Site Engineer the work procedure for each sub-activity to be done at the site, detailing the procedure / process to be followed including work sequence, safety measures, to be followed, level of quality to be maintained, type of material to be used, type of finishing required and responsibility assigned etc.

10. Cost of preparation and compliance with provision of a quality assurance control program.
11. Cost of safe guarding the environment.
12. Cost of safety measures and requirements of site safety plan.
13. A testing laboratory as specified by the Engineer equipped with the apparatus as mentioned in Employers requirement will be set up.

**1.1.9 Quality Assurance & Quality Control:**

1. The work shall conform to high standards of design and workmanship, shall be structurally sound and aesthetically pleasing. The Contractor shall conform to the Quality standards prescribed, which shall form the backbone for the Quality Assurance (QA) and Quality Control (QC) system.
2. At the site, the Contractor shall arrange the materials, their stacking/storage in appropriate manner to ensure the quality. The Contractor shall provide all the necessary equipment and qualified manpower to test the quality of materials, assemblies etc., as directed by the Engineer. The cost of all such testing shall be included in the quoted rates and nothing extra shall be paid for in this regard. The tests shall be conducted at specified intervals and the results of tests properly documented. In addition, the Contractor shall keep appropriate tools and equipment for checking alignments, levels, slopes and evenness of the surfaces.
3. The Engineer shall be free to carry out such tests as may be decided by him at his sole discretion, from time to time, in addition to those specified in this document. The Contractor may provide the samples and labour for collecting the samples. Nothing extra shall be payable to the Contractor for samples or for the collection of the samples.
  - a. The tests shall be conducted at the Site laboratory that may be established by the Contractor or at any other Standard Laboratory selected by the Engineer.
  - b. The Contractor shall transport the samples to the laboratory for which nothing extra shall be payable. In the event of the Contractor failing to arrange transportation of the samples in proper time, the Engineer shall have them transported and recover two times the actual cost towards transportation and testing from the Contractor's bills.
  - c. All testing shall be performed in the presence of Engineer. Testing may be witnessed by the Contractor or his authorized representative if permitted by the Test House. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.
  - d. Cost of all such tests shall be borne by the Contractor and nothing extra shall be payable on this account
4. The Engineer shall have the right at all times to inspect all operations including the sources of materials, procurement, layout and storage of materials, all equipment including the concrete batching and mixing

equipment, and the quality control system. Such an inspection shall be arranged and the Engineer's approval obtained prior to starting of the particular item of work. This shall however, not relieve the Contractor of his responsibilities. All materials which do not conform to these specifications shall be rejected and shall be removed from the site immediately. The Engineer shall have the powers to cause the Contractors to purchase and use materials from any particular source as may in the Engineer's opinion be necessary for the proper execution of work. Nothing extra shall be payable to the contractor on this account.

**1.1.10 Dimensions:**

- 1 Figured dimensions on drawings shall only be followed and drawings to a large scale shall take precedence over those to a smaller scale. Special dimensions or directions in the specifications shall supersede all others. All dimensions shall be checked on site prior to execution.
- 2 The dimensions where stated do not allow for waste, laps, joints, etc. but the Contractor shall provide at his own cost sufficient labour and materials to cover such waste, laps, joints, etc.
- 3 The levels, measurements and other information concerning the existing site as shown on the drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or the description of the ground levels or strata turning out different from what was expected or shown on the drawings.

**1.1.11 Setting out of Works:**

The Contractor shall set out the works indicated in the tender documents. The Contractor shall provide suitable stones with flat tops and build the same in concrete for temporary bench marks. All the pegs for setting out the Works and fixing the levels required for the execution thereof shall, if desired by the Engineer, likewise be built in masonry at such places and in such a manner as the Engineer may direct. The Contractor shall carefully protect and preserve all bench marks and other marks used in setting out the works. The contractor will make overall layout of complete work and get it checked from engineer. The cost of all operations of setting out including construction of bench marks is deemed to be included in the contract price.

All the survey work except levelling work shall be carried out using total stations with one second accuracy. The levelling work shall be carried out using Auto level.

The triangulation points given by MAHA METRO before start of work shall be maintained during execution and handed over back to MAHA METRO after completion of work.

**1.1.12 Materials:**

1. Source of Materials:  
It shall be the responsibility of the contractor to procure all the materials required for construction and completion of the contract. The contractor

shall indicate in writing, the source of materials well in advance to the Engineer, after the award of the work and before commencing the work. If the material from any source is found to be unacceptable at any time, it shall be rejected by the Engineer and the contractor shall forthwith remove the material immediately from the site as directed by the Engineer.

2. Quality:

All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Engineer and shall comply strictly with the tests prescribed hereafter, or where tests are not laid down in the specifications, with the requirements of the latest issues of the relevant Indian Standards.

3. Sampling and Testing:

All materials used in the works shall be subjected to inspection and test in addition to manufacturer's test certificates. Samples of all materials proposed to be employed in the permanent works shall be submitted to the Engineer at least 45 days in advance for approval before they are brought to the site.

Samples provided to the Engineer for their retention are to be labelled in boxes suitable for storage. Materials or workmanship not corresponding in character and quality with approved samples will be rejected by the Engineer.

Samples required for approval and testing must be supplied sufficiently in advance in required quantity and number to allow for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in completion of the works.

Materials shall be tested before leaving the manufacturer's premises, quarry or resource, wherever possible. Materials shall also be tested on the site and they may be rejected if not found suitable or in accordance with the specifications, notwithstanding the results of the tests at the manufacturer's works or elsewhere or test certificates or any approval given earlier.

The contractor will bear all expenses for sampling and testing, whether at the manufacturer's premises at source, or at site or at any testing laboratory or institution as directed by the Engineer. No extra payment shall be made on this account.

4. Dispatch of materials:

Materials shall not be dispatched from the manufacturer's works to the site without written authority from the Engineer.

5. Test certificates:

All manufacturer's certificates of test, proof sheets, etc. showing that the materials have been tested in accordance with the requirement of this

specification and of the appropriate Indian Standard are to be supplied free of charge on request to the Engineer.

6. **Rejection:**  
Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the Contractor at his own cost within two weeks or as instructed by the Engineer.
7. The Engineer shall have power to cause the Contractors to purchase and use such materials from any particular source, as may in his opinion be necessary for the proper execution of the work.

**1.1.13 Storing of Materials at site:**

All materials used in the works shall be stored on racks, supports, in bins, under cover etc. as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the Engineer.

The storage of materials shall be in accordance with IS 4082 "Recommendation on stacking and storage of construction materials on site" and as per IS 7969 "Safety code for handling and storage of building materials".

The materials shall be stored in a proper manner at places at site approved by the Engineer. Should the place where material is stored by the Contractor be required by the Employer for any other purpose, the Contractor shall forthwith remove the material from that place at his own cost and clear the place for the use of the Employer.

**1.1.14 Water:**

**1. Water from approved source:**

Potable water only shall be used for the works. Contractor shall have his own source of water duly approved by Engineer. The water shall be free from any deleterious matter in solution or in suspension and be obtained from an approved source. The quality of water shall conform to IS 456.

**2. Storage:**

The Contractor shall make his own arrangements for storing water, if necessary, in drums or tanks or cisterns, to the approval of the Engineer. Care shall be exercised to see that water is not contaminated in any way.

**3. Testing:**

Before starting any concreting work and wherever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use in concrete for approval of the Engineer. No water shall be used until tested and found satisfactory. Cost of arranging, storing and testing of water shall be deemed to be included in the quoted rates in the Bill of Quantities and nothing extra shall be payable in this regard.

**1.1.15 Workmanship:**

1. All works shall be true to level, plumb and square and the corners, edges and arises in all cases shall be unbroken and neat.

2. Any work not to the satisfaction of the Engineer or his representative will be rejected and the same shall be rectified or removed and replaced with work of the required standard of workmanship at no extra cost.

#### 1.1.16 LOAD TESTING ON COMPLETED STRUCTURES

- 1.1.16.1 During the period of construction or within the defect liability period the Engineer may at his discretion order the load testing of any completed structure or any part thereof if he has reasonable doubts about the adequacy of the strength of such structure for any of the following reasons:
  - a. Results of compressive strength on concrete test cubes falling below the specified strength.
  - b. Premature removal of formwork.
  - c. Inadequate curing of concrete.
  - d. Over loading during the construction of the structure or part thereof.
  - e. Carrying out concreting of any portion without prior approval of the Engineer.
  - f. Honey combed or damaged concrete which in the opinion of the Engineer is particularly weak and will affect the stability of the structure to carry the design load, more so in important or critical areas of the structure.
  - g. Any other circumstances attributable to alleged negligence of the contractor which in the opinion of the Engineer may result in the structure or any part thereof being of less than the expected strength.
- 1.1.16.2 All the load tests shall be carried out by the contractor strictly in accordance with the instructions of the Engineer, as per IRS: CBC-2014 Clause 18 and IRC: SP-51, as indicated in the Bill of Quantities and as indicated hereunder. Such tests shall be carried out only after expiry of minimum 28 days from day of casting or such longer period as directed by the Engineer.
- 1.1.16.3 Deleted.
- 1.1.16.4 In such cases the portion of the work concerned shall be taken down or cut out and reconstructed to comply with the specifications. Other remedial measures may be taken to make the structure secure at the discretion of the Engineer. However, such remedial measures shall be carried out to the complete satisfaction of the Engineer.
- 1.1.16.5 All costs involved in carrying out the tests (unless and until mentioned otherwise in these specification) and other incidental expenses thereto shall be borne by the contractor regardless of the result of the tests. The contractor shall take down or cut out and reconstruct the defective work or shall make the remedial measures instructed at his own cost. If the load testing is instructed on any ground other than mentioned in a) to g) of 1.1.16.1, then the cost of the same shall be reimbursed if the result of the test is found to be satisfactory. The load testing of spans / piles etc. shall be done using certified and calibrated dial gauges only. Use of levelling instruments for measuring deflections shall not be allowed.

- 1.1.16.6 In addition to the above load tests, non-destructive test methods such as pile integrity test, and ultrasonic pulse velocity test shall be carried out by the contractor at his own expense if so desired by the Engineer. Such tests shall be carried out by an agency approved by the Engineer and shall be done using only recommended testing equipment. The acceptance criteria for these tests shall be as specified by the testing agency or good engineering practices in accordance with the relevant codal provisions and as approved by the Engineer.

1.1.16.7 Tests of Precast Pretensioned Elements

One unit of each type of precast element shall be load tested upto to failure but its quantity shall not be measured for payment.

Prior to carrying out load tests, if required, the contractor shall submit arrangement of testing, loading etc. and shall carry out any modifications, if needed, on the existing testing arrangement to the satisfaction of Engineer in Charge at no extra cost. The contractor shall submit a report containing test results and observations etc. to the department.

**1.2. Structural Work:**

Unless specified, only controlled concrete with design mix and weigh batching is to be used for the work.

- 1.2.1 Minimum cement content specified in CPWD specification is purely from durability point of view. Larger content of cement shall have to be provided if demanded by mix design.
- 1.2.2 Provision of cement slurry to create bond between plain / reinforced concrete surface and subsequent applied finishes shall not be paid extra.
- 1.2.3 Mix design using smaller aggregates of 10mm down size shall also be done in advance for the use in the junctions having congested reinforcement.
- 1.2.4 Procedure of mixing the admixtures shall be strictly as per the manufacturer's recommendations if not otherwise directed by the Engineer.
- 1.2.5 All the water tanks and other liquid retaining concrete structures shall undergo hydro testing.
- 1.2.6 Special benches shall be provided at site for stacking reinforcement bars of different sizes.
- 1.2.7 Formwork for beams of RCC areas shall be designed in such a way that the formwork of the adjacent slabs can be removed without disturbing the props / supports of the beams.
- 1.2.8 Wherever there are tension / suspended concrete members which are suspended from upper level structural members, the shuttering / scaffolding of such members at lower level shall have to be kept in place till the time the upper level supporting members gain minimum required strength. Cost of such larger duration of keeping in place the shuttering/scaffolding shall be deemed to be included in the price quoted for respective structural members.

- 1.2.9 Formwork is required for full height at all locations. Special precaution for such tall formwork shall be taken to ensure its safety. Extra costs for such formwork shall be deemed to have been included in the price quoted against relevant items.

**1.3. Supply of Progress photographs and albums:**

The work covers the supply of colour photographs, negatives and albums to serve as a permanent record of various stages/facets of work needed for an authentic documentation as approved by the Engineer.

The photographs shall be of acceptable quality and they shall be taken by a professionally competent photographer with camera having the facility to record the date of the photographs taken in the prints and the negative. Each photograph in the album shall be suitably captioned and dated.

The photographs and materials including negatives/soft copies shall form a part of the records of MAHA METRO and prints of the same cannot be supplied to anybody else or published without the written permission of MAHA METRO.

**1.4. Supply of Video CDs:**

The work consists of taking video films of important activities of the works as directed by the Engineer during the currency of the Project and editing them to a video film of playing time not less than 60 minutes. It shall contain narration of the activities in English by a competent narrator. The edition of the film and script of the narration shall be approved by the Engineer.

**1.5. Survey Work:**

The said work involves at the very start of work taking-over of reference point from the Engineer, establishment of control points, triangulation points, bench marks, grid layout for all the piers and other structures maintaining horizontal and vertical control within the permissible limits, incorporating changes (if any), submission of full data in the tabulation form and survey drawings including setting and layout of various works during the progress of work and matching of the station area track alignment with the alignment of the approaches at station ends and incorporating the changes (if any).

**1.6. Barricading**

The work includes/covers barricading for the work to be carried out along the median and areas affecting road traffic. Barricading for the areas like casting yard, batching plant, storage and similar working area shall be done at own cost by the contractor. Other barricading along the median and areas affecting road traffic will be paid as schedule A (General Works) of BOQ The detailed scope of work is as follows:

- i. Providing and installing the barricades of the design and type as shown in the typical sketch furnished as per the approved plan firmly to the ground and maintaining it during the progress of work.
- ii. It is the primary responsibility of the contractor to ensure sufficient illumination (e.g.: rope lights etc.) along the barrication line to guide the road traffic. Any shortfall in this regard shall attract a penalty of Rs. 5000/- per instance or as decided by the Engineer-in-Charge.
- iii. In case of EOT granted to the contractor for any reason whatsoever, no additional compensation shall be paid to the contractor.



- iv. Dismantling of barricading and other temporary installations from the site and cleaning the site as per direction of Engineer upon completion and acceptance of work. The barricading boards shall be the property of the contractor upon completion of the work.
- v. 50 % of the barrication boards shall be painted and the remaining 50% shall be filmed as per the approved scheme and methodology. Repainting and re-filming of the same shall be ensured without fail at a regular interval of every six months. Nothing extra shall be paid in this regard.
- vi. To facilitate certain category(ies) of construction activities, it may be necessary to temporarily remove the barricades from a particular location and re install the same at the same location. No additional payment shall be made or can be claimed on account of such re-installation(s). However permanent removal of barrication boards from any location shall be permitted only just prior to road restoration.

### Tentative Road Safety Devices Brief Description

No.

1. Supply of Red portable heavy duty traffic cones of 750 mm height with white reflective tape bands on min. 100 mm width all around.
2. Hazard warning light flasher with rechargeable, maintenance free battery & charging system.
3. Safety light island post with 11 nos. parallel reflector.
4. Red reflective arrow fitted on enamelled mild steel board of 360 x 220 mm size.
5. Traffic Triangular Tripod made of fluorescent cloth fitted on steel frame.
6. Retro-reflective tape (I) 50 mm width.
7. Fluorescent Jackets with reflective tape all around.
8. Yellow reflective cat eyes of size 115 x 11 x 22 mm made of ABS material having 19 glass beads on each side.
9. Metal Tubular Delineator of 610 mm height with reflective tapes.
10. Retro-reflective arrows diversion board 450 x 900 mm with crystal clear protective transparent coat to avoid damage on 14-gauge Mild Steel sheet with and without pole.
11. Retro-reflective "Men at work" triangular board of size 900 mm with crystal protective transparent coat to avoid damage on 14-gauge Mild steel board with and without poles.
12. Retro-reflective board for "Go Slow Work in progress" of size 1200 x 750 mm with crystal clear protective transparent coat to avoid damages to the Mild Steel sheets with and without pole.
13. Retro-reflective advance direction signs cum diversion boards of size 1200 x 900 mm with crystal clear protective transparent coat to avoid damage to the 14-gauge mild steel sheet with and without pole.
14. Retro-reflective speed limit circular sign boards of 600 mm diameter with crystal clear protective transparent coat to avoid damage to the 14-gauge mild steel sheet (without pole).
15. **'SORRY FOR INCONVENIENCE'** Retro-reflective boards of size 900 x 300 mm size with crystal clear protective transparent coat to avoid damage to the 14-gauge Mild Steel Sheet (without pole).
16. **HAZARD MARKERS** (Yellow & Black) must be put all over the construction site. This Retro- reflective board is of size 300 x 900 mm with crystal clear protective transparent coat to avoid damage to the 14-gauge mild steel sheet with or without pole.

17. **'CAUTION'** tape which is normally yellow tape of special polythene material having 75 mm width **'CAUTION'** written all over with black colour in rolls of 300 meter.

**Measurement**

The barricading including all the required safety devices as listed under the above table shall be measured as per relevant item in BOQ. Payment shall be deducted for the period during which the barricading and arrangements for traffic diversion are not satisfactory to the Engineer.

**1.7. Transplantation of Trees - (DELETED)-****1.8. Finishing Work:**

- 1.8.1 The Contractor shall incorporate seismic considerations of anchoring and isolation in the design and detailing of the finishes as directed by the Engineer. The element to be anchored shall have its motion suitably restrained whilst at the same time it shall be suitably isolated so as not to be affected by the deformations/ vibrations of the building during Construction.

1.8.2 Sub-Contractor:

Works as listed below and those dealing with proprietary materials/ products may be carried out by the Contractor through the Sub-Contractors as may be approved by the Engineer in writing. The Sub-Contractors must be firms of repute and long standing, having adequate experience and complete facilities to carry out all items of work required for completion as per Specifications and expected quality to the satisfaction of the Engineer. The Sub- Contractor must also have personnel experienced in preparing shop drawings. All such works shall be carried out under the direct supervision of the manufacturers of the proprietary materials/ products or their trained and accredited licensee.

- (a) Waterproofing
- (b) Caulking & Sealants
- (c) Seismic Joints
- (d) Expansion joints
- (e) Application of Silicone water repellent solution where specified.
- (f) Bearings
- (g) Structural Glazing/cladding
- (h) Landscaping
- (i) Roof sheeting

1.8.3 Guarantees and Building Maintenance for Finishes:

The Contractor shall guarantee and undertake to maintain and rectify the various components of the Civil Works for their successful performance for the periods as specified below. The Contractor shall indemnify the Engineer for a similar period against any damage to property and injury to persons on account of any defective work or maintenance carried out by the Contractor. The format and text of the Guarantee and the Indemnity Bond shall be as followed in CPWD or as approved by the Engineer.

- a. External/Internal cladding of Stone, Marble and Granite shall be guaranteed for 5 years.

- b. All Fire Rated Door sets shall be guaranteed to remain integral and absolutely stable in the event of a fire. All moving parts of the Fire Rated Door sets shall be guaranteed to give trouble free service for 5 years and the finish shall be guaranteed to last for at least 5 years.
- c. Waterproofing for basements (which include raft, retaining walls, and expansion/ separation joints in retaining walls) and roofs shall be guaranteed for 10 years. The waterproofing shall include all allied works on the roof such as concrete screed and the China Mosaic roof finish/ stone cladding on the parapet between which the waterproofing treatment shall be sandwiched.
- d. Waterproofing for the other areas such as toilets, kitchens, chhajjas etc. shall be guaranteed for 10 years. The waterproofing shall include all allied works on the slab etc. such as concrete/ mortar scree ding, if any, floor finish between which the waterproofing treatment shall be sandwiched.
- e. The manufacturer / Supplier / fabricator/ contractor of the roofing system shall give a guarantee for 15 years with regarding to its composition, surface and tensile strength.

1.8.4 Responsibility for Shop drawings, Samples and Mock-ups:

Approval of shop drawings, samples and mock-ups for the various components shall not absolve the Contractor of his responsibility of completing the work to the specifications, standards, tests for performance and guarantees given in these documents and to a quality of finish as desired by the Engineer.

1.8.5 Cleaning:

Surfaces on which finishes are to be provided shall be cleaned with water jets or oil free compressed air or power tools with wire brushes and detergents all as approved by the Engineer.

1.8.6 **Expansion bolts/fasteners:**

- 1. Unless specified otherwise all expansion bolts/ fasteners shall be fabricated from austenitic stainless steel sheet, strip or plate conforming to ASTM A 240 Gr 304 or bar to ASTM A 479 Gr 304 of approved make and design. The material of the bolt shall not cause any bimetallic corrosion with the reinforcing bars of the RCC/ brickwork or with any other fixings or doors or windows or skylights etc.
- 2. For steel backings the fasteners shall be prevented from contact with other metals, which would lead to bimetallic corrosion.
- 3. For brick masonry backing the sleeves of the expansion bolts shall be fixed in wedge shaped pockets having an area of 75mm x 75mm at the surface and 100mm x 100mm at the inner surface and shall be 125mm deep. The wedge could also be as a truncated cone of 75mm dia/ 100mm dia. The dimensions shall be reviewed by the Engineer during execution of the work. The wedge shall be filled with PCC 1:1:2 (1 Cement, 1 Sand and 2 Coarse Aggregate) mixed with non-Shrink Compound in the proportion as recommended by the manufacturer.
- 4. The holes drilled for the expansion fasteners shall be cleaned of all ground material, dust etc. before inserting the expansion sleeves.
- 5. All expansion bolts fixed into soffits shall be bonded to the backing with epoxy/ polyester resin of approved make.
- 6. All expansion bolt fixings shall be tightened in accordance with the recommended torque figures by the manufacturer. Where such values are

not available the Contractor shall test at least 6 samples to determine the safe torque values. All bolts shall be tightened using torque spanner/ wrenches. All bolts shall be checked 24 hours (minimum) after installation and retightened if necessary.

- 1.8.7 No walls, terraces shall be cut for making any opening after water proofing has been done without written approval of the Engineer. Cutting of waterproofing when authorized by the Engineer in writing shall be done very carefully so that no other portion of the waterproofing is damaged. On completion of the work at such places, the water proofing membrane shall be made good and ensured that the opening / cutting is made fully water proof as per specifications and details of water proofing approved by the Engineer at no extra cost. No structural member shall be cut or chased without the written permission of the Engineer.
- 1.8.8 Provision of grooves in plaster, drip courses etc., if directed, at junction of walls-ceilings, columns-walls, frames-plaster and such other generally typical locations shall not be paid extra, including grooves in concrete, masonry, stonework. Painting of concrete surfaces.
- 1.8.9 All exposed concrete surfaces, either bare or plastered visible to the common public shall be provided with epoxy paint of approved colour as per relevant IS and IRS codes specification except for the surfaces which are provided with cladding material.

#### 1.9. Applicable Codes, Standards & Publications for Structural Work:

The more important Codes, Standards and Publications to Contract are listed here under:

##### A General

- IS: 875 (Part 1 to 5) Code of practice for design loads (other than earthquake) for buildings and structures.
- IS: 1893 Criteria for earthquake resistant design of structures
- SP-7 National Building Code of India
- SP-23 (S&T) Hand Book on Concrete Mixes

##### B Bitumen

- IS:702 Industrial Bitumen Specification for bitumen primer for use in waterproofing and damp-proofing.

##### C Building Construction Practice

- IS:1838 Specifications for preformed fillers for expansion joint in (Part I & II) concrete pavements and structures.
- IS: 1964 Code of Practice for use of fixing devices in walls, ceilings, and Floors of solid construction.
- IS: 3414 Code of Practice for Design and installation of joints in buildings.
- IS: 6509 Code of Practice for installation of joints in concrete.
- IS: 11134 Pavements. Code of Practice for setting out of buildings.
- IS: 11133 Specifications for one-part Gun grade poly-sulphide based joint sealant.
- (Parts I and I)
- IS: 12200 Code of Practice for provision of water stops at transverse contraction joints in masonry and concrete dams.

##### D Cement

- IS: 455 Portland Slag Cement.
- IS: 650 Specification for standard sand for testing cement.

IS: 6925	Me Methods of test for determination of water soluble chlorides in concrete admixtures.
IS: 8042	White Portland Cement.
IS: 8112	Specification for 43 grade ordinary Portland cement.
IS: 12269	Specification for 53 grade ordinary Portland cement.
IS: 12330	Specification for sulphate resistant Portland cement.
IS: T 40	Indian Railways standard specifications for special grade cement for use in concrete sleepers.

**E Concrete**

IS: 456	Code of practice for plain and reinforced concrete.
IS: 457	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
IS: 460	(Part I to II i) Specification for Test Sieves.
IS: 516	Methods of test for strength of concrete.
IS: 1199	Methods of sampling & analysis of concrete.
IS: 1200	Method of measurement of building and civil engineering.
IS: 1343	Code of practice for prestressed concrete.
IS: 1607	Method of Test Sieving.
IS: 2386	Part I-VIII Methods of tests for aggregates for concrete.
IS: 2430	Methods of Sampling of Aggregates of Concrete.
IS: 2438	Specification for roller pan mixer.
IS: 2514	Specification for concrete vibrating tables.
IS: 2571	Code of practice for laying in-situ cement concrete flooring.
IS: 2645	Specification for integral cement water proofing compounds.
IS: 2722	Specification for portable swing batchers for concrete (double bucket type).
IS: 2770	Method of testing bond in reinforced concrete part I pull out test.
IS: 3025	Methods of sampling and test (physical and chemical) for water & waste water.
IS: 3935	Code of practice for composite construction.
IS: 4326	Code of practice for earthquake resistant construction of building.
IS: 6925	Methods of tests for determination of water soluble chlorides in concrete admixtures.
IS: 7242	Specification for concrete spreaders.
IS: 7251	Specification for concrete finishers.
IS: 7861	Parts I & II Code of practice for extreme weather concreting.
IS: 7969	Safety code for handling and storage of building materials.
IS: 8989	Safety code for erection of concrete framed structures.
IS: 8142	Methods of tests for determining setting time of concrete by penetration resistance.
IS: 9103	Specification for admixtures for concrete.
IS: 9013	Method of making, curing and determining compressive strengths of accelerated cured concrete test specimens.
IS: 9284	Method of test for abrasion resistance of concrete.
IS: 10262	Recommended guidelines for concrete mix design.
MORTH	Specifications for Road and Bridge Works, Ministry of Road Transport and Highways (Roads Wing).
IRS	Concrete Bridge Code Standard Specification and Code of Practice for Road Bridges Section III Cement Concrete (Plain & Reinforced (First Revision).

**F Construction Plant and Machinery**

IS: 1791	Specification for batch type concrete mixers.
IS: 2505	General requirements for concrete vibrators: Immersion type.
IS: 2506	General Requirements for screed boards concrete vibrators.
IS: 3366	Specification for pan vibrators.
IS: 2558	Code of Practice for use of immersion vibrators for consolidating concrete.
IS: 4656	Specifications for form vibrators for concrete.
IS: 4925	Specification for concrete batching and mixing plant.
IS: 11993	Code of Practice for use of screed board concrete vibrators.

**G Formwork**

IS: 4990	Specification for plywood for concrete shuttering work.
IS: 87	Guidelines for the design and erection of false work for Road bridge.
IS: 806	Code of Practice for use of steel tubes in general building construction.
IS: 1161	Specification of steel tubes for structural purpose.
IS: 1239	Specification for mild steel tubes, tubular and other wrought steel fittings.

**H Gypsum and Gypsum Board****I Handling and Storage**

IS: 4082	Recommendation of slacking and storage of construction materials.
IS: 8348	Code of Practice for stacking and packing of stone slabs for transportation.

**J Instruments for Testing cement and Concrete**

IS: 5513	Specification for Vicat Apparatus.
IS: 5514	Specification for apparatus used in Le-Chatelier.
IS: 5515	Specification for compaction factor apparatus.
IS: 5320	Specification for concrete slump test apparatus.
IS: 7325	Specification for apparatus to determine constituents of fresh concrete.
IS: 10080	Specification for vibration machine.
IS: 10086	Specification for moulds for use in tests of cement and concrete.
IS: 10510	Specification for Vee-bee consist meter.

**K Joint Fillers**

IS: 1838 (part 1)	Preformed fillers for expansion joint in concrete pavements and structures (non-extruding and resilient type): Bitumen impregnated fib.
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**L Paints and Coatings**

IS: 2074	Ready mixed paint. Air drying, red oxide-zinc chrome, priming.
BS: EN:10152	Specification for electrolytic ally zinc coated cold rolled steel flat products.
	Technical delivery conditions.
Astma 164-71	Specification for electrode posited coatings of zinc on steel.

**M Pigments for Cement**

BS: 1014	Specification for pigments for Portland cement and Portland cement products.
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**N Reinforcement & Structural Steel**

IS:206	Code of Practice for use of Steel Tubes in General Building Construction
IS:210	Grey Iron Castings
IS:280	Mild steel wire for general engineering purposes
IS:432	Part I. Mild steel and medium tensile steel bars. Part II Hard drawn steel wire.
IS:451	Technical Supply conditions for Wood Screws
IS:806	Code of practice for use of steel tubes in general building construction
IS:815	Classification coding of covered electrodes for metal arc welding of structural steels
IS:1239	Specification for mild steel tubes, tubular and other wrought steel fittings
IS:1363	Black hexagon bolts, nuts and locknuts and black hexagon screws.
IS:1365	Slotted countersunk screws.
IS: 1566	(Part I) Specifications for hard-drawn steel wire fabric for concrete reinforcement.
IS:1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
IS:2502	Code of Practice for bending and fixing of bars for concrete reinforcement.
IS:2629	Recommended practice for hot-dip galvanising of iron and steel.
IS:2751	Code of Practice for welding of mild steel plain and deformed bars for reinforced concrete construction.
IS:4759	Hot-dip zinc coating on structural steel and other allied products.
IS:9417	Recommendations for detailing of reinforcement in reinforced concrete works

IS:14268	Recommendations for welding cold-worked steel bars for reinforced concrete construction.
IS:14268	Uncoated stress relieved low relaxation steel class 2 for Prestressed concrete
IS:226	Structural steel (Standard Quality)
IS:800	Code of practice for use of structural steel in general building construction.
IS:813	Scheme of symbols for welding.
IS:814	(Part I & Part II) Covered electrodes for metal arc welding of structural
IS:816	Code of practice for use of metal arc welding for general construction in mild steel.
IS:822	Code of practice for inspection of welds.
IS:961	Structural steel (High Tensile)
IS:1024	Code of practice for use of welding in bridges and structures subject to dynamic loading.
IS: 1030	Carbon steel casting for General Engineering Purposes
IS: 1120	Coach Screws
IS: 1367	Technical Supply Conditions for Threaded Fasteners
IS:1161	Steel tubes for structural purposes.
IS: 1182	Recommended practice for radiographic examination of fusion welded butt joints in steel plates.
IS: 1915	Code of Practice for Steel Bridges
IS:2016	Plain Washers
IS:2062	Structural steel (Fusion welding quality)
IS:3063	Single Coil Rectangular Section Sprint Washers for Nuts, Bolts and Screws
IS:3443	Crane Rail Sections
IS:3757	Specification for high tensile friction grip bolts.
IS:3600	Code of practice for testing of fusion welded (Part I) joints and weld metal in steel.
IS:5624	Specification for foundation bolts.
IS:4923	Hollow steel sections for structural use.
IS:6227	Code of practice for use of metal arc welding in tubular structure.
IS: 801	Code of practice for use of cold formed light gauge steel structural members' in general building construction.
IS:811	Specifications for cold formed light gauge structural steel sections.
IS:8500	Structural Steel Micro alloyed (Medium and high strength qualities) .
IS:8910	General requirements of supply of weld able structural steel.
IS: 9595	Recommendations for metal arc welding of carbon & carbon-Manganese steels.

**O Sand**

IS:383	Coarse and fine aggregates from natural sources for concrete.
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**P Sand**

IS:2750	Specification for steel scaffolding
IS:3696 (Part 1)	Safety Code of scaffolds and ladders: Scaffolds
IS:3696 (Part 2)	Safety Code of scaffolds and ladders: Ladders
IS:4014 (Part 1)	Code of practice for steel tubular scaffolding: Definition and materials
IS:4014 (Part 2)	Code of practice for steel tubular scaffolding: Safety regulations for Scaffolding
IRC:87	Guidelines for the design and erection of false work for road bridges

**Q Sealants**

IS:10959	Glossary of terms for sealants for building purposes
IS:11433(Part 1)	One-part grade polysulphide base joint sealant: General requirements
IS:11433 (Part 2)	One part grade polysulphide base joint sealant: Methods
IS: 13055	Methods of sampling and test for anaerobic adhesives and sealants
BS:5889	Specification for one part gun grade silicone-based sealant

**R Wood**

IS:303	Plywood for General Purposes.
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**S Bearing**

IRC:83 Part-II	Standard specifications and code of practice for road bridges Elastomeric Bearings
IRC:83 Part-III	Standard specifications and code of practice for road bridges Pot Bearings

**T Piling**

IS: 2911

PART-IRC:78 Bored Cast in-situ Concrete Piles

IRC:78

Standard specifications and code of practice for road bridges Foundation and Substructure.

**U****All Indian Railway Standards Metal**

V

Metal Specifications

ASTM B 221

Specification for aluminium-alloy extruded bars, rods, wires, shapes, and tubes.

**W Glazing****X Stone and Facing/Linings****Y Steel Corrosion Protection**

IS:9077

Code of practice for corrosion protection or steel reinforcement in reinforced brick work and RCC constructions.



**S.02: EARTHWORK**

- 2.1 These specifications shall be read in conjunction with the CPWD specifications 2019 with up-to-date correction slips, and other relevant specifications described in the S.01 of Section-VII-F of these specifications.
- 2.2 Results of the sub-surface investigations conducted at the project site are enclosed with the tender document. This information about the soil and sub-soil water conditions is being made available to the Contractor in good faith and the Contractor is advised to obtain details independently as may be considered necessary by him before quoting rates in the tender. No claim whatsoever on account of any discrepancy between the sub-surface conditions that may be actually encountered at the time of execution of the work and those given in these Tender Documents shall be admissible to the Contractor under any circumstances whatsoever.
- 2.3 Excavation of rock may be carried out by chiselling, jack hammers, crow bars, wedging and using cutting machine or by any other method approved by the Engineer, use of non-explosive demolition compounds shall also be permitted.

Open blasting is not permitted under scope of this contract but at discretion of the Engineer, controlled blasting may be permitted only in very special cases where all alternative methods have failed to achieve the satisfactory results. The Blasting, if permitted, shall be carried out within the pre-defined fixed period to be decided in consultation with and due permission of local authorities and approved by Engineer. Contractor shall take all necessary precautions to prevent flying of blasted stones outside the excavation pit and damage to adjacent structure etc. by controlling spacing and quantity of explosive charge and covering the sufficient area of blasting by steel plates loaded with adequate amount of sandbags. All operations of controlled blasting shall be carried out under the supervision of a responsible authorised blasting agent. Contractor shall be responsible for any damage arising out of blasting operation to workmen, public or any property. Contractor shall obtain all necessary permission from Traffic Police and other concerned authorities for blasting as required. Non-granting of permission for blasting by concerned authorities will not be considered as reason for delay or any claim thereof.

- 2.4 Excavation for all works and of materials required for filling shall be to the exact width length and depth shown on the drawings or as directed by the Engineer. Where the nature of soil or the depth of the trench and season of the year, do not permit vertical sides, the contractor at his own expense shall put up the necessary shoring, strutting and planking with due regard to the safety of personnel and works and to the satisfaction of the Engineer. The construction barricading will have a width of 9.0m (outside to outside of barricading). This can be increased at specific locations with approval of Engineer. The Contractor shall submit method statements for approval of Engineer demonstrating how this will be achieved at site. If required, driving of rolled section / sheet pile of suitable size shall be done into the soil to retain earth as directed by Engineer.

If excavation is carried out to greater depth than required beyond the level specified, for any reason whatsoever, such volume shall be made good by filling with PCC M10 having coarse aggregates 40 mm and downgraded and brought to level to receive the levelling course below foundations. If excavation is carried out to greater width and length, such extra width and length shall be filled in by sand. No extra payment will be made on this account.

Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontals from the bottom of the excavation.

All excavations shall be carried out in conformity with the directions laid hereunder and in a manner approved by Engineer. The work shall be so done that the suitable materials available from excavation are satisfactorily utilized as decided upon beforehand.

- 2.5 The last 200mm depth of excavation shall be done not earlier than 36 hours before laying the levelling course below foundations.

- 2.6 The Contractor shall make provision for all shoring, dewatering, dredging, bailing out or draining water whether subsoil or rain or other water and the excavation shall be kept free of water while the masonry work or concrete work is in progress and until the Engineer considers the work well set (Refer IS: 3764 Safety Code for Excavation Work). The sides of trenches shall be kept vertical and the bottom horizontal and shall be run level throughout or properly stepped as directed by the Engineer. No extra payment shall be made on this account.

Dewatering shall be carried out by suitable means with adequate stand-by arrangements as may be approved by the Engineer. The level of ground water shall be maintained at least 300mm below the lowest level of excavation during the laying of foundations. The Contractor shall be deemed to have satisfied himself with regard to feasibility of all aspects of dewatering including site constraints due to existing structures. Though the method of dewatering is left to the contractor, he shall be required to submit method statement of dewatering scheme including requisite justifications to the Engineer and seek his prior written approval.

Approval of the Engineer, however shall not relieve the contractor of the responsibility of adequacy and appropriateness of dewatering and protection arrangements for the quality and safety of the work. The contractor shall satisfy the Engineer as to the capacity of the drains or disposal site to take the required quantity and flow of water to be pumped out at various stages of excavation. The Contractor shall obtain necessary approvals of local bodies for discharging the pumped out water. All the dewatering pumps shall therefore also have dedicated DG. Power supply which shall come on automatically in case of failure of electrical supply from the mains. The cost of dewatering provisions shall be deemed inclusive in the quoted cost of the work for foundation works and embankment works in BOQ.

- 2.7 The Contractor shall erect and maintain during progress of works temporary fences with all safety measures around dangerous excavations at contractor's cost.

Near habitations and traffic prone areas, trenches and foundation pits or any other excavation work shall be fenced, provided with proper caution signs and marked with red lights, reflectors at night to avoid accidents. The contractor shall take all adequate protective measures to see that excavation operations do not affect or damage adjoining structures.

- 2.8 Excavation material required for filling shall be stacked or dumped where indicated by the Engineer. Excavated material not required for filling and any surplus material shall be removed or spread on the site as directed by the Engineer or carted away from the site as directed by the Engineer. Dumping of this surplus material shall be in an orderly environmental in friendly manner using tarpaulin cover, dumper, placer etc. and according to the levels/grades as indicated by the Engineer. The cost of such removal and spreading shall be borne by the Contractor and deemed to be included in the Contract Rates. Necessary approval from the local authorities for carting and dumping surplus material is to be obtained by the contractor.

- 2.9 The Contractor shall notify to the Engineer when the excavation is completed and no base or Concrete or Masonry shall be laid until the Engineer has inspected and approved of the soil conditions obtained for each individual footing or the full raft area.
- 2.10
- 2.11 The Contractor shall ensure the stability of the excavation so that the surrounding ground and all adjoining structures and plants will be safe against settlement, subsidence and damage and that there is no risk of injury to personnel.
- 2.12 In case of any underground structures that need to be protected (like underground sewer lines etc.) are encountered, the Contractor shall bring the same to the notice of the Engineer immediately and shall take all such steps as the Engineer may instruct for protection of such structures. Such protective measures shall be done at the Contractor's cost. If any damage occurs to such items which were required to be protected during execution, the same shall be made good by contractor at his own cost otherwise employer will arrange to make it good at the risk and cost of contractor.
- 2.13
- 2.14 The Contractor may dispose of the surplus earth from the project site to a place/ places as may be permitted by the Engineer. The transportation of the surplus earth shall be done by mechanical means only. The Contractor shall at his own cost obtain necessary clearances/ permissions statutory or otherwise needed for the purpose. Dumpers may be used for transporting slushy material excavated from pile boring / well boring / pile cap / Open Foundation with precautions for non-spillage of muck.
- 2.15 In the foundation the backfilling shall be done in layers not more than 200 mm thick and shall be thoroughly watered and consolidated by approved method.
- 2.16
- 2.17 In case sand is used for backfilling in foundation and plinth, it shall be approved by the Engineer. In the foundation, the backfilling shall be done in layers not more than 200 mm thick and shall be thoroughly watered and consolidated by approved method. The rate for backfilling using sand in foundation is deemed to have been included in the contract price.
- 2.18 For open foundation resting on rock, if the sound rock is located at very shallow depth, the contractor is required to cut the rock (of all type or strength) to a depth so that open foundation with a minimum earth cushion of 500mm can be accommodated.
- 2.19 **Measurement and Payment (Not applicable for Schedule B)**  
Payment for excavations in soil and/or rock, including providing and installing shoring / strutting, dewatering, pumping and bailing out water shall be made as per the quoted rate of the respective items of excavation as specified in BOQ. However, unless stated otherwise, the quoted rates for concrete in foundation (up to ground level) shall be deemed to include the cost of shoring, strutting, dewatering and backfilling using earth or sand wherever required with compaction of the same.

**S.03: CONCRETE: PLAIN & REINFORCED**

These specifications shall be read in conjunction with the CPWD specifications 2019 with up-to-date correction slips, MOST/MORTH Specifications for Road and Bridge Works 2013 (Fifth Revision) and other relevant specifications with up-to-date correction slips described in the S.01 of Section-VII-F of these Specifications.

**3.1 MATERIALS**

Before bringing to the site, all materials for concrete shall be approved by the Engineer. All approved samples shall be deposited in the office of the Engineer before placing orders for the materials with suppliers. The materials brought for works shall conform in every respect to their approved samples.

Fresh samples shall be deposited with Engineer whenever type or source of any material changes. The contractor shall check fresh consignment of materials as it is brought on to the works to ensure that they conform to the specifications and/or approved samples.

The Engineer shall have the option to have any of the materials tested to find whether they are in accordance with specifications at the contractor's expense. All bills, vouchers and test certificates which in the opinion of the Engineer are necessary to convince him as to the quality of materials or their suitability shall be produced for his inspection when required.

Any materials which have not been found to conform to the specifications and not approved by the Engineer shall be rejected forthwith and shall be removed from the site by the contractor at his own cost within the time stipulated by the Engineer. The Engineer shall have the powers to cause the contractor to purchase and use materials from any particular source, as may in his opinion be necessary for the proper execution of work.

Contractor shall also ensure that all constituents of exposed concrete shall be taken from same sources to achieve a uniform colour and texture.

**3.1.1 Cement**

3.1.1.1 The cement used shall be of the following types:

- a) 53 grade Ordinary Portland Cement conforming to IS:269 – 2015.
- b) Blended Cement as per IS 1489 Part-1:2015 on the specific approval by Engineer.

For piling works, type of cement shall be as mentioned in **S.08** of Section-VII-F for pile foundations.

3.1.1.2 Whenever possible all cements of each type shall be obtained from one constant source throughout the contract, cement of different types shall not be mixed together. Different brands of cement, or the same brand of cement from different sources, shall not be used without prior approval of the Engineer.

3.1.1.3 Packaged cement shall be delivered to the site in original sealed bags which shall be labelled with the weight, name of manufacturer, brand and type. Cement received in torn bags shall not be used. Cement shall be used in the order in which it is received. Cement in bags in storage for more than 3 months shall be retested before use. A sample taken once for every 1000 bags or part therefor as per Engineer's decision shall be tested.

Contractor may obtain cement in bulk and store it in suitable silos of adequate capacity. Each type of cement shall be stored in a separate silo and it shall be ensured, that cements of different quality are not mixed up.

Supply of cement in bulk and storage in silos is compulsory at casting depots. Cement supply in bags will be only with the specific approval of the Engineer.

- 3.1.1.4 All cement shall be fresh when delivered and at ambient atmospheric temperature.
- 3.1.1.5 In fair faced elements, the cement used in the concrete for any complete element shall be from 3 single consignments. All cement for exposed concrete shall be from the same approved source and uniform in colour.
- 3.1.1.6 With each and every delivery of cement the contractor shall provide manufacturer's certificate that the cement conforms to the relevant Indian standard. The contractor shall provide complete facilities at site for carrying out the following tests:
- a) Setting time by vicat's apparatus as per IS:4031 and IS:5513.
  - b) Compressive strength of cement as per IS: 4031, IS:650, IS: 10080.
  - c) Fineness & Soundness
- The Engineer may require any other form of sampling and tests including chemical analysis (IS 4032) in case the cement supplied is of doubtful quality. The cost of such additional tests shall be borne by the Contractor.
- 3.1.1.7 All physical and chemical properties of OPC-53 should meet the requirements as per IS 269 – 2015. Sampling and testing of OPC 53 grade cement shall be done as per IS 269-2015. The cost of testing shall be borne by the contractor and nothing extra shall be paid in this regard. Usage of Fly-Ash as part replacement for Cement is permitted as an eco-friendly move subject to the following conditions:
- a) Fly ash cannot be used as part replacement for cement in PSC members.
  - b) Fly ash to be used as part replacement for cement shall conform to the provisions listed in IS 3812 Part I and shall be limited to 25% of the cement in Substructure component such as Pier and Pier Caps.
  - c) As an alternative to (b) above PPC Cement can be used and shall be as per IS 1489 (Part I)
  - d) Should comply minimum and maximum cement as well as cementitious requirements as per latest revision/amendments/correction slip of the Specifications stated or referred in this contract.

### 3.1.2 Aggregate

Aggregates from natural sources shall conform to the provisions specified in IS:383. Prior to commencing any concrete work, the Contractor shall obtain the Engineer's approval of the proposed types and sources of aggregate. Sampling of aggregates shall be as per IS 2430. The contractor shall submit to the Engineer, certificates of grading and compliance for all consignments of aggregate. In addition, at site from time to time, the contractor shall allow for carrying out such tests and for supplying test records to the Engineer. The

aggregates shall be procured from approved sources only as directed by the Engineer from time to time.

For fair faced concrete, the contractor shall ensure that aggregates are free from iron pyrites and impurities, which may cause discoloration. Aggregates shall be stored on paved areas in different compartments according to their nominal size.

#### **3.1.2.1 Fine Aggregate**

The contractor shall provide complete facilities at site for determining grading of aggregates by sieves as per IS: 383, IS: 460, IS: 1607, and IS: 2386. The fine aggregate shall be river sand pit sand, crushed sand. It shall be free from clay, loam, earth or vegetable matter, salt or other harmful chemical impurities. It shall be clean, sharp, strong, angular and composed of hard siliceous material. If considered by the Engineer as necessary, the sand shall be washed in screw type mechanical washers in potable water to remove silt, clay and chlorides. This shall be done at least one day before using it in concrete. The washed sand shall be stored on a sloping concrete platform and in such a manner as to avoid contamination. Such sand washing, storing, etc. shall be at the Contractor's cost. The grading of fine aggregate when determined as described in IS: 2386 (part I), shall be within the grading zones I, II. (Usage of stone dust or M. Sand shall only be permitted if the Engineer is satisfied with the performance and Quality of the material. Decision of the Engineer will be deemed as final)

The Contractor shall carry out the following tests at Site and ensure that the appropriate provisions of Indian or other standards, as may be applicable, are complied with:

- a. Proportion of clay, silt and fine dust by sedimentation method as per IS 383 and IS 2386 (Part II)
- b. Moisture content in fine aggregate as per IS 2386 (Part III)
- c. Water absorption as per IS 2386 (Part III) and IRC: 15 (CL. 3.3.4)
- d. Bulk Density of Bulkage as per IS 2386 (Part III)
- e. Grading of fine aggregate as per IS 383 and IS 2386 (Part I)

#### **3.1.2.2 Coarse Aggregate**

The nominal maximum size of the coarse aggregate shall be 20 mm, unless otherwise mentioned in the Drawings. The coarse aggregate shall be crushed stone, crushed gravel, natural gravel or a suitable combination thereof. Coarse aggregate obtained from crushed or broken stone shall be angular, hard, strong, dense, durable, clean and free from soft, friable, thin plate, elongated or flaky pieces and any deleterious material.

River gravel or pit gravel shall be sound, hard, clean, non-porous, suitably graded in size with or without broken fragments and free from flat particles of shale, clay, silt, loam, and other impurities.

Except where it can be shown to the satisfaction of the Engineer that a supply of properly graded aggregate of uniform quality can be maintained over the said period of the works, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in correct proportions as and when required. Aggregate shall be stored in such a way as to prevent segregation of sizes and avoid contamination with fines.

All coarse aggregate shall conform to IS: 383 and tests for conformity shall be carried out as per IS: 2386, Parts I to VIII.

The maximum size of coarse aggregate shall be such that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the corners of formwork. The grading of coarse aggregate shall be such that not more than 5% shall be larger than the maximum size and not more than 10% shall be smaller than the smallest size. Between these sizes the coarse aggregate shall be well graded. Unless otherwise permitted by the Engineer the nominal maximum size shall not exceed 20 mm.

The Contractor shall carry out the following tests at site and ensure that the appropriate provisions of following Indian standards as may be applicable are complied with:

- a. Moisture content in coarse aggregate as per IS 2386 (Part III)
- b. Water absorption as per IS 2386 (Part III) and IRC 15 (CL. 3.3.3)
- c. Bulk density and voids as per IS 2386 (Part III)
- d. Grading of coarse aggregate as per IS 383 and IS 2386 (Part I)

### **3.1.2.3 Water**

Water used in the works shall be potable water and free from deleterious materials. Water used for mixing and curing concrete as well as for cooling and/or washing aggregate shall be fresh and clean free from injurious amounts of oil, salts, acids, alkali, sugar, other chemicals and organic matter.

Water shall be from the source approved by the Engineer and shall be in accordance with clause 5.4 of IS: 456. However, chloride content in water shall not exceed 500 mg/litre.

Before starting any concreting work and wherever the source of water changes, the water shall be tested for its chemical and other impurities to ascertain its suitability for use in concrete for approval of the Engineer. No water shall be used until tested and found satisfactory. Cost of all such tests shall be borne by the contractor.

### **3.2 Blending of aggregates:**

In order to obtain optimum workability, individual aggregates of nominal size 20 mm, 10 mm, 4.75 mm and 2.36 mm will be blended in such a way that the grading curve for all aggregates will be a smooth curve from size 0.15 mm to 25 mm falling within the established envelop grading curve. Contractor shall establish envelop grading curve for each grade of concrete for given maximum size of aggregates and get it approved by Engineer before finalising the mix design.

### **3.3 Admixtures:**

- i Chemical admixtures are not to be used until permitted by the Engineer. In case their use is permitted, the type, amount and method of use of any admixtures proposed by the Contractor shall be submitted to the Engineer for approval. The minimum cement content specified shall not be reduced on account of the use of these Admixtures.
- ii The contractor shall further provide the following information concerning each admixture to the Engineer
  - a. Normal dosage and detrimental effects if any of under dosage and over dosage.
  - b. The chemical names of the main ingredients in the admixtures.
  - c. The chloride content, if any, expressed as a percentage by weight of admixture. The admixture shall be chloride free.

- d. Whether or not the admixture leads to the entrainment of air when used with in the manufacturer's recommended dosage.
- iii The chemical admixtures when used shall conform to IS: 9103 and manufacturers technical datasheets. The suitability of all admixtures shall be verified by trial mixes and based on the performance.
- iv The addition of calcium chloride to concrete containing embedded metal will not be permitted under any circumstances.
- v Fibre reinforcement will be Propex (Fiber mesh 300-e3 / Fiber mesh 150-e3) or by Bajaj reinforcements or kalyani polymers or equivalent make fibre reinforced polypropylene fibres, shall be added to ready-mixed concrete wherever the material is to be used for parapet, box girder etc. Bar reinforcement is still considered primary reinforcement. Under normal condition, add to the ready-mix at the plant in the quantity recommended by the manufacturer subjected to the approval of engineer-in-charge. If job conditions warrant fiber reinforcement may be added at the job site provided that fibers are evenly distributed in the mix. Notwithstanding the same, Fibre reinforcement shall conform to IRC:SP:46 (2013).

### **3.4 Batching Plants, Mixers and Vibrators:**

1. Unless specified in the schedule of items, for all structural concreting work the Contractor shall provide automatic weigh-batching plant of suitable capacity. The plant used shall conform to IS: 4925.
2. The Contractor shall provide Concrete mixers (IS: 1791 - Batch type concrete mixers, IS: 2438 - Roller Pan Mixer) and Vibrators (IS: 2505 - Concrete Vibrators Immersion Type, IS: 2506 - Screed board concrete vibrators, IS: 4656 - Form Vibrators for Concrete) supplied by recognised manufacturers.

### **3.5 Grade of Concrete:**

The concrete is designated as follows:

Concrete M 25 / 20

The letter M refers to the mix

The number 25 represents the characteristic compressive strength of 15cm cubes at 28 days in MPa (Mega Pascal: 1 MPa: 10 kg/cm<sup>2</sup> approximately). M25 concrete thus, has a characteristic strength of 250 kg/cm<sup>2</sup>. Other mix design will also be denoted in same way. The number 20 represents the nominal size of the aggregate in mm.

### **3.6 Mix Design**

For all items of concrete, only design mix shall be used. Prior to the commencement of construction, the Contractor shall design the mix and submit the proportions of materials, including admixtures to be used to the Engineer for obtaining approval. Suitable water reducing admixtures or super-plasticizing and viscosity modifying agent (VMA) admixtures shall be used for achieving desired workability and strength of the concrete only after obtaining prior approval from the Engineer. No extra payment shall be made for such admixtures.

It is the complete responsibility of the Contractor to design the concrete mixes by approved standard methods and to produce the required concrete conforming to the specifications and the strength, workability requirements approved by the Engineer.



Mix Design Once approved must not be altered without prior approval of Engineer and shall be revalidated after every one year. However, should the contractor anticipate any change in quality of future supply of materials than that used for preliminary mix design, he should inform the Engineer quite in advance and bring fresh samples sufficiently in advance, to carry out fresh trial mixes. Design mix will indicate by means of graphs and curves etc., the extent of variation in the grading of aggregates which can be allowed.

The total amount of acid soluble chloride content in RCC and PSC mix shall not exceed 0.6 Kg/Cum and 0.4 Kg/Cum respectively and sulphate contents in concrete mix shall not exceed 4.0 percent respectively by weight of cement.

#### Limits of Water and Cement Contents

##### Maximum water/cement ratio

a) For RCC members including piles - 0.40

b) For PSC members - 0.40

For piling under water, water-cement ratio of 0.40 is applicable to cement concrete including 10% extra cement above the design mix or minimum cement whichever is greater.

#### **Trial Mixes:**

- a) The Contractor is entirely responsible for the design of the concrete mixes. However, the design shall have approval from the Engineer. At least 8 weeks before commencing any concreting in the works, the Contractor shall make trial mixes using samples of coarse aggregates, sand, water, superplasticiser and cement, typical of those to be used in the Works, and which have been tested in an approved laboratory. A clean dry mixer shall be used, and the first batch shall be discarded.
- b) The mix shall be designed to produce the grade of concrete having the required workability, durability and a characteristic strength. Trial mixes shall be prepared under full-scale site conditions and tested in accordance with IS 10262.
- c) Whenever there is a significant change in the quality of any of the ingredients concrete, the Engineer, at his discretion, may order the carrying out of fresh trial mixes. All costs for trial mixes and tests shall be borne by the Contractor's and held to be included in the contract rates.
- d) Before commencing the Works, the Contractor shall submit full details of the preliminary trial mixes and tests to the Engineer for approval.

#### **Cementitious Content**

Maximum cementitious material content shall be limited to 500 Kg/Cum for both RCC and PSC work.

Maximum cement content shall be limited to 450 Kg/Cum for both RCC and PSC work.

Cementitious content in concrete shall not be less than 400 kg/ cum for RCC work and 400 kg/ cum for PSC work under moderate exposure as per Clause 5.4 of IRS CBC (Note: The corrigendum 12 and addendum to this clause shall not be followed.) In case of piling work minimum cement content shall be as specified under Pile Foundations. Use of Fly Ash conforming to IS 3812 Part-I shall be permitted except for pre stressed superstructure.

As regards trial mixes, acceptance criteria, acceptance specification, lot size, sampling and testing and sampling size for piling work, PSC girders (cast-in-situ and precast post-tensioned) and general work, the requirement of the relevant codes, standards and directions of the Engineer shall be followed.

### 3.7 Additional tests for Concrete:

Special durability testings for concrete such as oxygen permeability and chloride ion migration test as per NT BUILD 492 shall be carried out as required and directed by the engineer. The cost of samplings for such testings shall be borne by the contractor and the testing charges will be borne by Employer.

As frequently as the Engineer may require, additional testing shall be carried out for concreting in addition to mandatory tests specified in CPWD specifications 2019 / relevant IS Code / MOST/MORTH Specifications. All the codes shall be latest and updated irrespective of the version mentioned in these technical specifications

a. Permeability test for Concrete:

The concrete will be verified for permeability by the following procedure and shall confirm to IS: 3085-1965 - 'Permeability of Cement Mortar & Concrete', Section 1717.7.5 of MORTH Specification and DIN 1048.

b. The Engineer shall select random batches of concrete for examination at his discretion and sampling will generally be done at the point of discharge from the mixer and at placing point.

From the batches thus selected two concrete cylinders shall be made in accordance DIN 1048.

c. All cylinders shall be made, cured, stored, transported and tested in accordance with clause 1717.7.5 of MORTH Specifications. The tests shall be carried out in a laboratory approved by the Engineer.

d. At least, 60 cylinders shall be made for each grade of concrete per component which shall be uniformly distributed (Proportional) to the total quantity of concrete of that grade of that component. The cylinders will be tested as per the procedure, given in Clause 5 next.

Permeability of concrete shall be checked as per the latest relevant standard for all the grade of concrete to the frequency set by the Engineer at own or 3<sup>rd</sup> party laboratory approved by the Engineer.

e. Test Procedure:

The permeability of concrete will be verified by the following procedure.

- i. Prepare a cylindrical test specimen of 150 mm dia and 160mm high.

- ii. After 28 days of curing, the test will be conducted between 28 and 35 days. The test specimen shall be fitted in a machine such that the specimen can be placed in water under pressure up to 7 bars. The typical machine shall be similar to one shown in Appendix 1700/I of MORTH.
- iii. The concrete specimen shall be subjected to a water pressure of  $0.5\text{N/mm}^2$  from the top for a period of 3 days. The pressure shall be maintained constant throughout the test period. If the water penetrates through to the underside of the specimen, the test may be terminated and specimen rejected as failed.
- iv. After three days, the pressure shall be released and the sample shall be taken out. The specimen shall be split in the middle by compression applied on two round bars on opposite sides above and below.
- v. The water penetration in the broken core is measured with scale and the depth of penetration assessed in mm (max permissible limit 25 mm).

**f. Acceptability Criteria:**

The concrete shall pass the permeability test if it is properly compacted and is not considered permeable when tested as per DIN, and the water penetration in the broken core is less than 15mm for metro structures.

No extra payment shall be made for this test and cost of the same will be included in his rate for concrete work.

**3.8 Batching of Concrete Ingredients:**

Unless permitted by the Engineer, all concreting shall be either produced in automatic weigh batching plant installed at site or Ready Mix Concrete manufactured in automatic weigh batching plant. Prior approval of RMC plant shall be obtained from the Engineer before supply. The Engineer or his representative will evaluate the condition of plant, QMS and consistency of RMC in accordance with IS: 4925 to deliver quality concrete before giving the approval. Engineer has the power to reject approved RMC at any point of time if he is not satisfied with the quality or service maintained by the agency. Engineer's decision will be deemed as final.

**3.9 Placing temperatures:**

During extreme hot or cold weather, the concreting shall be done as per procedures set out in IS: 7861, Parts I & II.

In hot weather with ambient temperature exceeding 40 degrees Celsius, the stock piles of fine and coarse aggregates for concreting shall be kept shaded from direct rays of sun and the concrete aggregates sprinkled with water for a sufficient time before concreting in order to ensure that the temperature of these ingredients is as low as possible prior to batching. The mixer and batching equipment shall be also shaded and if necessary painted white in order to keep their temperatures as low as possible. **The placing temperature of concrete shall be as low as possible in warm weather but in no case more than 30 degrees Celsius** and care shall be taken to protect freshly placed concrete from overheating by sunlight in the first few hours of its laying. The time of day selected for concreting shall also be chosen so as to minimise placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked and used directly in the mix or blocks used for chilling the mixing water. In either case, the Contractor shall not be paid extra for cost of ice,

additional labour involved in weighing and mixing etc. All salt and saw dust shall be removed from ice before use. Quality of water used for making ice shall confirm to IS: 456. It is mandatory to establish a chiller plant near batching plant to cater to the needs of acceptable temperature of fresh concrete. Nothing extra shall be paid in this regard. Contractor is solemnly responsible for delivering concrete within restricted temperature at site.

### **3.10 Transporting, Placing, Compacting and Curing:**

Transporting, placing, compacting and curing of concrete shall be in accordance with IS: 456.

a. **Transporting:**

The mix after discharging from the mixer shall be transported by transit mixers, buckets, pumps etc. or as approved by the engineer without causing segregation and loss of cement slurry and without altering its desired properties with regard to water cement ratio, slump, air content, cohesion and homogeneity. It should be ensured that the concrete is moved to its final destination before it attains an initial set.

The transportation is to be done by agitating transit mixers, pumps or other approved methods. During hot weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporation in hot weather such as covering/wrapping transit mixer's drum by hessian cloth may also be adopted.

b. **Placing:**

The method of placing shall be such as to prevent segregation by providing windows in the formwork for pouring concrete or by Tremie pipe. The thickness of horizontal layers shall not exceed 300mm. High velocity discharge of concrete causing segregation of mix shall be avoided. The concrete shall be placed in the forms gently and not dropped from a height exceeding 1.5m except in columns where the maximum allowed will be 2.0m. Each layer of concrete shall be compacted fully before the succeeding layer is placed and separate batches shall follow each other so closely that the succeeding layer shall be placed and fully compacted before the layer immediately below has taken initial set.

For piers, pier heads, portal columns and portal beams the concreting is to be carried out in single stage i.e. in first stage concreting will be from kicker to just below pier head bottom and second stage of concreting will be pier head including shear key and cross girder (in station zone stages as given in drawings for all heights by using tremie/ pumps at the rate not more than 1.5m / hr or as approved by the Engineer.

Concreting of any portion or section of the work shall be carried out in one continuous operation and no interruption of concreting work will be allowed without; approval of the Engineer.

c. **Compaction:**

Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete.

Internal vibrators shall be used for compaction of concrete in foundations, columns, buttresses arch section, slabs etc., and if required surface vibrators shall also be used. Depending on the thickness of layer to be compacted, 25 mm,

40 mm, 60 mm and 75 mm dia internal vibrators will be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until:

- i) Air bubbles cease to come to surface.
- ii) Resumption of steady frequency of vibrator after the initial short period of drop in the frequency, when the vibrator is first inserted.
- iii) The tone of the vibrated concrete becomes uniform.
- iv) Flattened, glistening surface, with coarse aggregates particles blended into it appears on the surface.
- v) Use of curing compounds may be permitted with specific approval of Engineer.

After the compaction is completed, the vibrator should be withdrawn slowly from the concrete so that concrete can flow in to the space previously occupied by the vibrator. To avoid segregation during vibration the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be made to penetrate, into the layer of fresh concrete below if any for a depth of about 150mm. The vibrator shall be made to operate at a regular pattern of spacing. The effective radii of action will overlap approximately half a radius to ensure complete compaction.

- vi) To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic.
- vii) A sufficient number of spare vibrators shall be kept readily accessible to the place of deposition of concrete to assure adequate vibration in case of breakdown of those in use.
- viii) Form vibrators whenever used shall be clamped to the sides of formwork and shall not be fixed more than 450 mm above the base of the new form work and concrete shall be filled not higher than 230mm above the vibrator. The formwork must be made specially strong and watertight where this type of vibrator is used.  
Care must be taken to guard against over vibration especially where the workability of the concrete mix is high since this will encourage segregation of the concrete.
- ix) Plain concrete in foundations shall be placed in direct contact with the bottom of the excavation, the concrete being deposited in such a manner as not to be mixed with the earth. Plain concrete also shall be vibrated to achieve full compaction.

- d. Concrete placed below the ground shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free from contact with such ground and with water draining there from during placing and for a period of seven days or as otherwise instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, deleterious ground water, mixing with earth or other materials, and other influences that may impair the strength and durability of the concrete.

- e. Curing:

- i. Curing of concrete shall be complete and continuous using potable water free from chlorides and sulphates. Water that is free of harmful amounts of deleterious materials that may attach stain or discolour the concrete as per IS 456. The concrete shall be kept constantly wet for a minimum period of 14 (fourteen) days by ponding or covering with a layer of wet (but not dripping) sacking, canvas, hessian or similar absorbent material.
- ii. Method of curing and their duration shall be such that the concrete will have satisfactory durability and strength and members will suffer a minimum distortion, be free from excessive efflorescence and will not cause undue cracking in the works by shrinkage.
- iii. Steam curing with approved methodology can be adopted if required, for precast segments. No extra payment will be made for adopting steam curing. Before concrete products are subjected to any accelerated method of curing, the cement to be used shall be tested in accordance with accepted standards (relevant IS codes) especially for soundness, setting time and suitability for steam curing. In the case of elements manufactured by accelerated curing methods, concrete admixtures to reduce the water content may be allowed to be as permitted by applicable codes of practice subject to the approval of the Engineer. The normal aeration agents used to increase the workability of concrete shall not be allowed. The steam curing of concrete products shall take place under hoods, under chambers or in tunnels. Use of insulated tarpaulin may be permitted. The steam shall have a uniform quality throughout the length of the member. The precast elements shall be stacked with sufficient clearance between each other and the bounding enclosure, so as to allow proper circulation of steam. The surrounding walls, the top cover and the floor of steam curing chamber or tunnel or hood shall be so designed as not to allow more than 1 kcal/m<sup>2</sup>/h/ degC. The inside face of the steam curing chamber, tunnel or hood shall have a damp-proof layer to maintain the humidity of steam. Moreover, proper slope shall be given to the floor and the roof to allow the condensed water to be easily drained away. At first, when steam is let into the curing chambers, the air inside shall be allowed to go out through openings provided in the hoods or side walls which shall be closed soon after moist steam is seen jetting out. Preferably, steam should be let in at the top of the chamber through perforated pipelines to allow uniform entry of steam throughout the chamber. In no case shall steam impinge directly on concrete products. The fresh concrete in the moulds shall be allowed to get the initial set before allowing the concrete to come into contact with steam. The regular heating up of fresh concrete product from 20 °C to 35 °C shall start only after a waiting period ranging from 2 to 5 hours depending on the setting time of cement used. The second stage in steam curing process shall be to heat up the concrete elements, moulds and the surroundings in the chamber. The air-space around the member shall be heated up to a temperature of 75°C to 80°C at a gradual rate, not faster than 30° C per hour. This process shall continue 1 1/2 to 2 1/2 hours depending upon the outside temperature. The third stage of steam curing shall be to maintain the uniform temperature and pressure for a duration depending upon thickness of the section. This may vary from 3 to 5 1/2 hours. The fourth stage of steam curing shall be the gradual cooling down of concrete products and surroundings in the chamber and normalization of the pressure to bring it at par with the outside air. The maximum cooling rate, which is dependent on the thickness of the member, shall not exceed 30° C per hour. In all these cases, the difference between the temperature of the concrete product and the outside temperature

shall not be more than 60°C for concrete up to M 30 and 75°C for concrete greater than M 45. In the case of light weight concrete, the difference in temperature shall not be more than 60°C for concrete less than M 25. For concrete greater than M 50, the temperature differences may go up to 75°C. After the steam curing is completed, the elements shall be further water cured for about 3 to 7 days.

Curing Compound shall be used only after specific approval from Engineer-in-Charge. Clear, water based, non-toxic, non-film forming, reactive silicate treatment with indefinite shelf life suitable as a complete replacement to any water curing procedures such as water soak, ponding, blankets and plastic sheets for all horizontal and vertical surfaces. Manufacturer shall supply written proof of completed, successful projects for upto 30 years.

Approved curing compounds may be used in lieu of moist curing with the permission of the engineer. Such compounds shall be applied to all exposed surfaces of the concrete along with stripping of form work. Tests shall be done to ascertain: (i) Loss of moisture in concrete with and without curing compound. (ii) Cube strength of concrete with moist curing and curing compound. (iii) Permeability of concrete.

Application of curing compound shall be done after prior approval from the Engineer or his representative at site. Nothing extra will be paid for any related activity for supplying or applying the curing compound in lieu of moist curing or grinding it after the curing period for painting the structure if any.

- iv. Curing compound should have been successfully tested by CRRI as a replacement for water curing and accredited by IRC also. Material test result should be in compliance with ASTM C 309 and ASTM 1315°.

**No curing compound is allowed for superstructure members.**

### **3.11 Construction Joints:**

Construction joints in all concrete work shall be made as directed by the Engineer. Where vertical joints are required, these shall be shuttered as directed and not allowed to take the natural slope of the concrete.

Before fresh concrete is placed against a vertical joint, the old concrete shall be chipped, cleaned and moistened.

No separate payment shall be allowed to the Contractor for forming joints or chipping and cleaning them. When a horizontal construction joint is formed, provision shall be made for interlocking with the succeeding layer by the embedment of saturated wooden blocks or wooden strips bevelled on four sides to facilitate their removal. Prior to the next pour the wooden pieces shall be loosened and removed in such a manner as to avoid injury to the concrete.

Construction joints in concrete walls and slabs for liquid retaining structures shall be prepared in a similar manner to normal construction joints. If use of metal, rubber or plastic water stops is specified, this shall be cast in to joints. Measures shall be taken by the contractor to ensure that no displacement or distortion of water stops takes place during placing of concrete. The construction joints shall ensure proper bond and leak proof joint. Construction joint is not permitted in superstructure members.

### **3.12 Cracks:**

If cracks, which in the opinion of the Engineer may be detrimental to the strength of the construction, develop in concrete construction, the Contractor at his own expense shall test the structure as specified in clause 1.1.16 of 'Load Testing' of these Specifications. If under such test loads the cracks develop further, the Contractor shall dismantle the construction, carry away the debris, replace the construction and carry out all consequential work thereto.

If any cracks develop in the concrete construction, which in the opinion of the Engineer, are not detrimental to the stability of the construction, the Contractor at his own expense shall grout the cracks with neat cement grout or with other composition as directed by Engineer (IRC:SP -40) and also at his own expense and risk shall make good to the satisfaction of the Engineer all other works such as plaster, moulding, surface finish, which in the opinion of the Engineer have suffered damage either in appearance or stability owing to such cracks. The Engineer's decision as to the extent of the liability of the Contractor in the above matter shall be final and binding.

External crack width shall be restricted to 0.2 mm on all viaduct structures, if cracks width is more than 0.2 mm or in the opinion of Engineer may be detrimental to concrete construction, the contractor at his own expenses should test the structure.

**3.13 Defective Concrete:**

Should any concrete be found honeycombed or in any way defective, such concrete shall be cut out partially or wholly by the Contractor and made good at his own expense. If Engineer feels that repaired structure will not be having same strength or shape or uniformity with other exposed surface as original desired structure / original structure, the same shall be rejected by Engineer and required to be dismantled and disposed by contractor at his own cost as instructed by Engineer. Decision of the Engineer shall be final and binding in this regard.

**3.14 Exposed Faces, Holes and Fixtures:**

On no account shall concrete surfaces be patched or covered up or damaged concrete rectified or replaced until the Engineer or his representative has inspected the works and issued written instructions for rectification. Failure to observe this procedure will render that portion of the works liable to rejection.

Holes for foundation or other bolts or for any other purposes shall be moulded and steel angles, holdfasts or other fixtures shall be embedded, according to the drawing or as instructed by the Engineer.

**3.15 Finishes:**

Unless otherwise instructed the face of exposed concrete placed against formwork shall be rubbed down immediately on removal of the formwork to remove irregularities. The face of concrete for which formwork is not provided other than slabs shall be smoothed with a float to give a finish equal to that of the rubbed down face, where formwork is provided. The top face of a slab which is not intended to be covered with other materials shall be levelled and floated to a smooth finish at the levels or falls shown on the drawings or as directed. The floating shall be done so as not to bring an excess of mortar to the surface of the concrete. The top face of a slab intended to be surfaced with other material shall be left with a spaded finish. Faces of concrete intended to be plastered shall be roughened by approved means to form key.

**3.16 Concrete for flooring on grade:**

Concrete for flooring on grade shall be placed in alternate bays not exceeding more than 4m x 6m or as specified in the drawings including forming the joints or adjacent bays. The stiff mix shall be thoroughly vibrated and finished to receive the floor finish.



**3.17 Grouting of base plates & bolt holes:**

- i. **Mixing:**  
Dry grout should be mixed in a mechanical mixer: the conventional 200/400-litre capacity concrete mixer can be used to mix four bags of dry grout; alternatively, paddle type mortar mixers can be used. The quantity of grout to be mixed at one time should not exceed that amount which can be placed in approximately 10 to 15 minutes.
- ii. **Batching:**  
Batching of grout by fraction of a bag is not allowed. The quantity of mixing water should be the minimum commensurate with workability, compaction, and filling of the grout in all corners and crevices. Mixing should be done for a minimum of three minutes to obtain a fluid grout of uniform consistency.
- iii. **Cleaning and preparation of the surface:**  
The base concrete should be clean and strong, and its surface should be properly hacked; all dust should be removed by suction or compressed air. The surface should be thoroughly wetted with water for several hours. Before the grout is poured, all free water should be removed and the flat surfaces coated with a thin cement slurry.
- iv. **Restraint:**  
Heavy back-up blocks of timber or concrete should be fixed on all sides of the base plate to prevent escape of the grout, when poured through the openings provided in the base plate. Adequate restraint must be ensured on all the sides for a period of 7 days to obtain effective expansion and shrinkage compensation.
- v. **Curing:**  
The grout should not dry out where external restraint is provided in the form of formwork, the top opening and all stray openings should be covered with wet sack for at least 7 days.
- vi. **Placing and Compaction:**  
The grout should be placed quickly and continuously either through the holes in the base plates or from one side only to ensure complete filling without entrapment of air. Grout should be properly spread and compacted by rodding. Excessive vibration should be avoided. Below the bed plates the grout should be compacted using long pieces of doubled- over flexible steel strapping or chains. The forward and backward movement of the strap or chain will assist in the flow of the grout into place. Steps must be taken to keep the grout in full contact with the underside of the bedplate until the grout sets; maintaining a small head of fresh grout in the forms.
- vii. **Shrinkage Compensated Grout:**  
Shrinkage compensated grout or non-shrinkable grout of Associated Cement Companies Limited or any other approved manufacturer (Fosroc, Sika) should be used. The batching shall be as per the manufacturer's specifications, other procedures being as above.

**3.18****(a) Precast Concrete:**

The provision in this section shall be considered supplementary to general provisions for reinforced concrete works.

**Handling and Storage:**

The precast units shall be stored as directed by the Engineer. The area intended for the storage of precast units should be surfaced in such a way that no unequal settlement can occur.

To prevent deformation of slender units, they should be provided with supports at fairly close intervals and should also be safeguarded against tilting. Lifting and handling positions should conform to the Engineer's directions and drawings. In addition, location and orientation marks should be put on the members, as and where necessary. During erection the precast units should be protected against damage caused by local crushing and chafing effects of lifting and transport equipment.

**Temporary Supports and Connections:**

Temporary supports provided during erection should take into account all construction loads likely to be encountered during the completion of joints between any combination of precast and in-situ concrete structural elements. The supports should be arranged in a manner that will permit the proper finishing and curing of any in-situ concreting and grouting associated with the precast member being supported when the gaps of joints have to be filled with concrete or mortar. They should first be cleaned and faces of the joints should be wetted. The mixing, placing and compacting of cement and mortar should be done with special care. Mortar of a dry consistency should be in the proportion of 1:1% (1 part of cement to VA parts of sand) and should be placed in stages and packed hard from both sides of the joint.

**Tolerances:**

The following tolerances apply to finished precast products at the time of placement in the structure. The forms must be constructed to give a casting well within these limits:

- i. Overall dimensions of members should not vary more than  $\pm 6\text{mm}$  per 3m length with a maximum variation of  $\pm 20\text{mm}$ .
- ii. Cross-sectional dimensions should not vary more than the following:
  - $\pm 3\text{mm}$  for sections less than 150mm thick
  - $\pm 4\text{mm}$  for sections over 150mm & less than 450mm
  - $\pm 6\text{mm}$  for sections over 450mm to 1000mm.
  - $\pm 10\text{mm}$  for sections over 1000mm

Deviation from straight line in long sections should not be more than  $\pm 5\text{mm}$  up to 3m,  $\pm 10\text{mm}$  for 3m to 6m,  $\pm 12\text{mm}$  for 6m to 12m.

For tolerances on precast segments for girders please refer Annexure 11.2.

- (b) Structural steel inserts/bolts for connecting precast concrete elements  
GI Square rods with internal threading and GI base plate/stiffener, shall be firmly fixed in the mould to the true line, level and alignment as shown in drawings. If required by engineer MS template may use for above purpose. The threaded hole/pipe shall be properly protected so as to prevent ingress of mortar etc. (by providing dummy bolts, PVC cover, cotton waste etc.).

**3.19 Ready Mix Concrete and Pumping:**

- i. Ready-mixed concrete may be manufactured in a central automatic weigh Batching plant and transported to the place of work in agitating transit mixers shall conform to IS:4926.

The maximum size of coarse aggregate shall be limited to one-third of the smallest inside diameter of the hose or pipe used for pumping. Provision shall be made for elimination of over-sized particles by screening or by careful selection of aggregates. To obtain proper gradation it may be necessary to combine and blend certain fractional sizes of aggregates. Uniformity of gradation throughout the entire job shall be maintained.

The quantity of coarse aggregate shall be such that the concrete can be pumped, compacted and finished without difficulty.

- ii. Fine aggregates:

The gradation of fine aggregate shall be such that 15 to 30 percent should pass the 0.30 mm screen and 5 to 10 percent should pass 0.15 mm screen so as to obtain pump able concrete. Sands, which are deficient in either of these two sizes, should be blended with selected finer sands to produce these desired percentages. With this gradation, sands having a fineness modulus between 2.4 and 2.8 are generally satisfactory. However, for uniformity, the fineness modulus of the sand should not vary more than 0.2 from the average value used in proportioning.

- iii. Water, Admixtures and Slump:

The amount of water required for proper concrete consistency shall take into account the rate of mixing, length of haul, time of unloading, and ambient temperature conditions.

Additions of water to compensate for slump loss should not be resorted to nor should the design maximum water-cement ratio be exceeded. Additional dose of retarder be used to compensate the loss of slump at contractor's cost, when permitted by Engineer. Retempering water shall not be allowed to be added to mixed batches to obtain desired slump.

- iv. Transportation:

The method of transportation used should efficiently deliver the concrete to the point of placement without significantly altering its desired properties with regard to water- cement ratio, slump, and homogeneity.

The revolving-drum truck bodies of approved make shall be used for transporting the concrete. The numbers of revolutions at mixing speed, during transportation, and prior to discharge shall be specified and agreed upon. Reliable counters shall be used on revolving drum truck units. Standard mixer uniformity tests, conforming to ASTM standards C 94-69 "Standard Specifications for Ready Mix Concrete", shall be carried out to determine whether mixing is being accomplished satisfactorily.

- v. Pumping of concrete:

Only approved pumping equipment, in good working condition, shall be used for pumping of concrete. Concrete shall be pumped through a combination of rigid pipe and heavy duty flexible hose of approved size and make. The couplings used to connect both rigid and flexible pipe sections shall be adequate in strength to withstand handling loads during erection of pipe system, misalignment, and poor support along the lines. They should be nominally rated for at least 3.5 MPa pressure and greater for rising runs over 30 m. Couplings should be designed to allow replacement of any section without moving other pipe sections, and should provide full cross section with no construction or crevices to disrupt the smooth flow of concrete.

All necessary accessories such as curved sections of rigid pipe, swivel joints and rotary distributors, pin and gate valves to prevent backflow in the pipe line, switch valves to direct the flow into another pipe line, connection devices to fill forms from the bottom up, extra strong couplings for vertical runs, transitions for connecting different sizes of pipe, air vents for downhill pumping, clean-out equipment etc., shall be provided as and where required. Suitable power controlled booms or specialized crane shall be used for supporting the pipe line.

vi. Field control:

Sampling at both truck discharge and point of final placement shall be employed to determine if any changes in the slump and other significant mix characteristics occur. However, for determining strength of concrete, cubes shall be taken from the placement end of line.

vii. Planning:

Proper planning of concrete supply, pump locations, line layout, placing sequence, and the entire pumping operation shall be made and got approved. The pump should be as near the placing area as practicable, and the entire surrounding area shall have adequate bearing strength to support concrete delivery pipes. Lines from pump to the placing area should be laid out with a minimum of bends. For large placing areas, alternate lines should be installed for rapid connection when required. Standby power and pumping equipment should be provided to replace initial equipment, should breakdown occur. The placing rate should be estimated so that concrete can be ordered at an appropriate delivery rate.

As a final check, the pump should be started and operated without concrete to be certain that all moving parts are operating properly. A grout mortar should be pumped into the lines to provide lubrication for the concrete, but this mortar shall not be used in the placement. When the form is nearly full, and there is enough concrete in the line to complete the placement the pump shall be stopped and a go-devil inserted and shall be forced through the line by water under pressure to clean it out. The go-devil should be stopped at a safe distance from the end of the line so that the water in the line will not spill into the placement area. At the end of placing operation, the line shall be cleaned in the reverse direction.

### 3.20 Additional Specifications for Concrete M60 and above

- (a) Mineral admixture in the form of micro silica or condensed silica fume shall be permitted in the design mix. It shall comply with IS 15388 (2003) and ASTM C

1240 "Specifications for Fume for use in Hydraulic Cement Concrete and Mortar". It shall be obtained from proven and reliable manufacturer/supplier to the satisfaction of the Engineer.

- (b) Adequate and complete dispersal of the micro silica during the concrete mixing shall be ensured.
- (c) When micro silica is used in powder form the contractor shall take all precautions against potential health hazards during handling of the material.
- (d) Chilled water and/ or ice shall be used in the concrete mix depending on the ambient temperature, dimensions of the concrete element, rate of pouring and design mix constituents.
- (e) Special profuse curing arrangements shall be made for dissipation of the heat of hydration. The water curing shall be continued for a period of 14 days.
- (f) The concrete design mix and arrangement for mixing, transportation, and curing of concrete shall be subject to the approval of the Engineer.

### **3.21 Measurement (Not applicable for Viaduct Lump sum portion (Schedule B)):**

Concrete and reinforcement shall be paid separately unless otherwise "specified. Measurement shall be made for the finished volume of reinforced cement concrete (excluding lean concrete) only. All linear dimensions shall be measured correct to 1cm & restricted to design dimensions, and the volume calculation will be correct to two decimal places in cubic metres. The volume of concrete measured shall include that occupied by:

- 1 Reinforcement and other metal sections.
2. Cast in components each less than 0.01 cum in volume.
3. Rebates fillets or internal splays each less than 0.005 Sq.m in cross sectional area.
4. Pockets and holes not exceeding 0.01 m<sup>3</sup> in volume.

Rates for precast concrete shall include remoulding, handling, storing, transporting and erecting at site, including all clamping, bracing that may be required during erection including erection equipment.

### **3.22 Inspection, Tests and Standards of Acceptance**

- a. The Contractor shall submit test certificates from the manufacturer or supplier of materials along with each batch of material(s) delivered to site.
- b. The Contractor shall set up a field laboratory with necessary equipment for testing of all materials, finished products to be used in the construction.
- c. The testing of all the materials shall be carried out by the Contractor at the field laboratory or from the laboratory approved by the Engineer and in the presence of the Engineer. The Contractor shall make all the necessary arrangements and bear the entire cost for the same.
- d. Tests which cannot be carried out in the field laboratory shall be done at the Contractor's cost at any recognised laboratory or testing establishments having NABL certification and duly approved by the Engineer.
- e. If materials are brought from abroad, the cost of sampling or testing, whether in India or abroad, shall be borne by the Contractor.
- f. The Contractor shall provide and maintain on site, until the works are completed, at all times the equipment and staff required for carrying out these tests. The Contractor shall grant the Engineer or his representative full access to his laboratory at all times and shall, on demand, produce complete records of all tests carried out on the Site.
- g. The permeability test shall be proportional to the quantity executed for particular grade and component to ensure that the test is uniformly distributed throughout the quantity executed.

- h. Notwithstanding to what is specified in the relevant codes the requirements for metro structures for concrete from durability consideration shall be as under.
  - i. Permeability as per MORTH – shall be less than 15mm
  - ii. RCPT values shall be less than 1500 coulomb for concrete without microsilica or silica fume or ultrafine flyash/GGBS. The RCPT value shall be less than 1000 Coulomb for concrete with micro silica or silica fume or ultrafine flyash/GGBS.

**3.23**

- a. The Contractor shall carry out the following tests for concrete, at his own cost, at the site of placing. and ensure that they comply with appropriate provisions of Indian and/or other standards, as may be applicable:
  - i. Slump test for concrete: The frequency of slump test shall be conducted once in each delivery of transit mixer as per IS: 1199 & IS: 7320. Tolerance for slump shall conform to IS 4926 (CL. 6.2.1).
  - ii. Compressive and Flexural strength of concrete: Sampling, Strength tests and Acceptance criteria of concrete shall conform to IS: 456 & IS 1199. according to the type of concrete grade. For the purpose of precast segment lifting and pre-stressing of segments, additional concrete cube samples shall be casted as directed by the Engineer-In-Charge.
  - iii. Chloride ion content test: It shall be conducted once a week. Test method shall be as per manufacturer's instructions and conforming to IS 456.
  - iv. Relative Density and pH value of plasticizer (if used): The test shall conform to IS 9103 and the tolerances shall be as specified in IS:9103.
  - v. Temperature of concrete shall be verified once in each slump test.
  - vi. The concrete shall be verified for permeability and the test procedure along with tolerances shall conform to the provisions given in these specifications. The frequency of test shall depend upon the change in design mix or change in source of material used in the work. However, the Engineer shall select random batches of concrete for examination at his discretion, and any time during concreting. Sampling shall generally be done at the point of discharge from the mixer and at placing point. The concrete shall pass the permeability test if it is properly compacted and the water penetration depth in the broken core is less than 25 mm.
  - vii. Rapid chloride penetration test (RCPT) shall be done for every 1000 cum of concrete executed of each grade where the concrete quantity is more than 10000 cum. Where the quantity of particular grade is less than 10000cum it shall be ensured that at least 10 test are done.
- b. It is the complete responsibility of the Contractor to redesign the concrete mixes as per the standard methods that have been approved and to produce the reinforced concrete conforming to the specifications. The Contractor shall have competent staff to carry out this work.
- c. After the completion of the quality control checks of concrete, the Contractor shall immediately report the test results to the Engineer by submitting quality control records of the concrete.
- d. All the third party testing of construction material shall be done in NABL accredited laboratory approved by the engineer. In case, Maha-Metro establishes its own laboratory all the testing shall be done in that laboratory.

**3.24 Failure to meet specified Requirements:**

- i. If from the cube test results, it appears that some portion of the Works has not attained the required strength, the Engineer may order that portion of the structure be subjected to further testing of any kind whatsoever as desired by the Engineer,

including, if so desired by him, full load testing of the suspected as well as adjacent portions of the structure as specified in the Conditions of Contract. Such testing shall be at the Contractor's own cost. The Engineer may also reject the work and order its demolition and reconstruction at the Contractor's cost.

- ii If the strength of concrete in any portion of the structure is lower than the required strength, but is considered nevertheless adequate by the Engineer so that demolition is not necessary, the Contractor shall be paid a lower rate for such lower strength concrete as determined by the Engineer.

### **3.25 Inspection of Concrete**

- a. Inspection shall be carried out by the Contractor, after the removal of formwork. Also, additional inspection shall be carried out if instructed by the Engineer.
- b. Inspection shall be carried out as per approval of the Engineer and in accordance with approved Method Statement.
- c. Additional non-destructive tests (NDT) on the hardened concrete in the structure as a whole or any finished part of the structure where necessary, or directed by the Engineer.
- d. The Contractor shall report the inspection results along with the location to the Engineer immediately after the inspection.
- e. If defects such as deleterious cracking, deformation, and finishing defects are noticed from the results of the inspection, no repair work shall be commenced without prior permission taken from the Engineer. Countermeasures against the defects shall be subjected to approval of the Engineer. In this case, "repair work" refers to all actions which make alterations to the surface of concrete after the removal of formwork (including plastering etc.). If repair work is required, the Contractor shall submit Method Statement on the repair work and shall obtain approval of the Engineer for the same, prior to the commencement of repair work. During the repair work, the Contractor shall record about the work, and shall report to the Engineer on the results of the work immediately after the repair work has finished.
- f. If cracks develop in concrete construction, provisions given elsewhere in these specifications shall be followed.

**S.04: FORM WORK**

- 4.1 These specifications shall be read in conjunction with the CPWD specifications 2019 with up-to-date correction slips, MOST/MORTH (5<sup>th</sup> Revision) Specifications and other relevant specifications described in the S.01 of Section-VII-F of these specifications.

4.2 **Materials:**

Formwork shall be of timber, plywood (including marine plywood), steel or any other suitable material capable of resisting damage to the contact faces under normal conditions of fixing steel, erecting forms and placing concrete. The selection of materials suitable for form work shall be made by the Contractor based on the quality consistent with the specified finishes and safety. For designated areas prominently in public view like piers, pier caps, portals, pier arms and any precast members forming a part of viaduct etc., only steel shuttering shall be used. Steel material shall be in good condition. It should not be corroded. Condition of material shall be decided by the Engineer and if found not complying as per relevant standards or requirements, it shall be replaced. Number of uses (repetitions) for steel shuttering shall be between 50 and 100. However, the no of uses shall be decided by Engineer as per the condition of steel shuttering. Special finishes like grooves, logos, floral designs to be incorporated in the steel shutter itself during its fabrication. The material shall be approved by the Engineer before being erected at site. However, the entire responsibility of planning, designing, erection, dismantling, shifting and safety of false work lies with the contractor.

All formwork and formwork supports (centering, props, scaffolds etc.) shall only be in structural steel and preferably of pipes conforming to IS:806, IS:1161, IS:1239, IS:2750. Wooden ballies shall not be permitted as props/formwork supports. All props shall be properly braced using x & k bracings. Ladders to be used at site should have treads and shall be fabricated from structural steel. Wooden / bamboo / aluminium / pipe ladders shall not be permitted. No additional payment to be made for all types of formwork and formwork supports including ladders to the contractor.

**Plywood:**

Plywood used for formwork shall be minimum 12 mm thick. Shuttering quality plywood complying with IS: 4990 and of make approved by the Engineer. Suitable stiffeners and wallers shall be provided depending on the shuttering design.

**Steel:**

Steel formwork shall be made of minimum 4 mm thick black sheets stiffened with angle iron frame made out of M.S. angles 40mmx 40 mm x 6 mm supported at suitable spacing.

4.3 **Design & Drawings:**

All temporary works such as formwork, false work, staging, launching girder, cantilever form traveller scheme etc. shall be designed by the Contractor. The permissible stresses in materials of formwork, false work, staging, launching girder & cantilever form traveller shall be limited as same as that for permanent structure. All calculations and drawings of the same including construction sequence shall be checked and verified by independent agency appointed by contractor. Only after the checking of the same, the calculations and drawings (along with soft copy in CD ROM) shall be submitted to Engineer for approval well in advance of work. All temporary works shall also be inspected by the independent agency and independent report shall be submitted to Engineer. All temporary works shall be robust, safe and constructed such a way that the concrete can be properly placed and



thoroughly compacted to obtain the required shape, position and level subject to specified tolerances. It is the responsibility of the Contractor to obtain the results required by the Engineer, whether or not some of the work is sub-contracted. Approval of the temporary works by the Engineer shall not diminish the Contractor's responsibility for the satisfactory performance of the same, nor for the safety and co-ordination of all operations.

For pier formwork, it shall be ensured that total deflection (taking account of combined deflection of plate, stiffeners, wallers or any other supporting arrangement) shall not be more than 3 mm. All the formwork, launching truss and cantilever form traveller and other selected temporary works shall be tested for the load including factor of safety for which the truss/formwork is designed before use in works at no extra cost.

The design of false work should be such as to facilitate easy and safe access to all parts for proper inspection. Methodology for removal of form should be planned as a part of total form work design.

In case of pre-stressing concrete, careful consideration shall be given to re-distribution of loads due to pre-stressing.

#### 4.4 Formwork for Exposed Concrete Surfaces:

The facing formwork, unless indicated otherwise on drawings, or specifically approved by the Engineer in writing, shall generally be made with materials not less than the thickness mentioned below for different elements of the structure:

- i. Plain slab soffit and sides of beams, girders, joists and ribs and side of walls, fins, parapets, pardis, sun-breakers, etc. shall be made with:
  - a. Steel plates not less than 4mm thick of specified sizes stiffened with a suitable structural framework, fabricated true to plane.
  - b. Timber planks of 20mm actual thickness and of specified surface finish, width and reasonable length.
  - c. Plywood not less than 12mm thick (IS:4990 - Specification for Plywood for Concrete Shuttering Work) stiffened with a suitable timber frame work or 3mm thick plywood with a 20mm timber plank backing, of specified sizes stiffened with a suitable timber framework and bracing. At joints 6mm/10mm sponge to be provided.
- ii. Bottoms of beams, girders and ribs, sides of columns shall be made with:
  - a. Steel plates not less than 5mm thick of specified sizes stiffened with a suitable structural framework, fabricated true to plane.
  - b. Timber planks of 35mm actual thickness and of specified surface finish width and reasonable length.
  - c. Plywood plates not less than 12mm thick (IS 4990), of specified sizes stiffened with a suitable timber framework as approved by Engineer.
- iii. For Precast segments, precast girders, piers, pier heads, portals etc. suitable steel form work is to be used unless otherwise specified by Engineer.

- iv. For station areas suitable steel form work is to be used unless as specified by Engineer.

**4.5 Formwork for Sloped Surfaces:**

- i Forms for sloped surfaces shall be built so that the formwork can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration inspection and finishing of the concrete.
- ii The formwork shall also be built so that the boards can be removed one by one from the bottom up as soon as the concrete has attained sufficient stiffness to prevent sagging. Surfaces of construction joints and finished surfaces with slopes steeper than 2 horizontals: 1 vertical shall be formed as required herein.

**4.6 Formwork for Curved Surfaces:**

- i The contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form lumber shall be built up of laminated splices cut to make tight, smooth form surfaces.
- ii After the forms have been constructed, all surface imperfections shall be corrected and all surface irregularities at matching faces of form material shall be dressed to the specified curvature.

**4.7 Formwork for Waffle Slab:**

DELETED

**4.8 Erection of Formwork:**

The following shall apply to all kinds of formwork:

- i To avoid delay and unnecessary rejection, the Contractor shall obtain the approval of the Engineer for the design of forms and the type of material used before fabricating the forms. (Ref. ACI 347 Formwork for Concrete or equivalent 1.3 Code).
- ii All shuttering planks and plates shall be adequately backed to the satisfaction of the Engineer by sufficient number and size of wallers or framework to ensure rigidity during concreting. All shutters shall be adequately strutted, braced and propped to the satisfaction of the Engineer to prevent deflection under deadweight of concrete and superimposed live load of workmen, materials and plant, and to withstand pouring rate and vibration.
- iii Vertical props shall be supported on wedges or other measures shall be taken where the props can be gently lowered vertically during removal of the formwork. Props for an upper level shall be placed directly over those in the level immediately below, and the lowest props shall bear on a sufficiently strong area. Care shall be taken that all formwork is set plumb and true to line and level or camber or better where required and as specified by the Engineer.
- iv Provision shall be made for adjustment of supporting struts where necessary. When reinforcement (dowel bars) passes through the formwork care should be taken to ensure close fitting joints against the steel bars so as to avoid loss of fines during the compaction of concrete.
- v If the formwork is held together by bolts, these shall be so fixed that no iron will be exposed on surfaces against which concrete is to be laid. In any case wires shall not be used with exposed concrete formwork. The Engineer may at his discretion allow the Contractor to use tie-bolts running through the concrete and the contractor shall

- decide the location and size of such tie-bolts in consultation with the Engineer. Holes left in the concrete by these tie-bolts shall be filled as specified by the Engineer at no extra cost. These tie-bolts are not to be provided in structures with exposed surfaces.
- vi Provision shall be made in the shuttering for beams, columns, and walls for a port hole of convenient size so that all extraneous materials that may be collected could be removed just prior to concreting.
  - vii Formwork shall be so arranged as to permit removal of forms without jarring the concrete. Wedges, clamps and bolts shall be used wherever practicable instead of nails. The formwork for beams and slabs shall be so erected so that forms on the sides of the beams and the soffit of slabs can be removed without disturbing the beam bottoms or props under beams.
  - viii Surfaces of forms in contact with concrete shall be oiled with a mould oil of approved quality (form releasing agent). If required by the Engineer the contractor shall execute different parts of the work with different mould oils to enable the Engineer to select the most suitable. The use of oil which results in blemishes on the surface of the concrete including Diesel oil, burnt oil or any other lubricating oil shall not be allowed. Oil shall be applied before reinforcement has been placed and care shall be taken that no oil comes in contact with the reinforcement while it is being placed in position. The formwork shall be kept thoroughly wet during concreting and the whole time that is left in place. Nothing extra shall be paid to contractor for oiling.
  - ix Immediately before concreting is commenced, the formwork shall be carefully examined to ensure the following:
    - a) Removal of all dirt, sawdust and any other refuse by brushing and washing and compressed air / vacuum cleaning.
    - b) The tightness of joints between panels of sheathing and between these and any hardened core.
    - c) The correct location of tie bars, bracing and spacers and especially connections of bracing.
    - d) Adequate cover blocks are in place.
    - e) Straightness and plumbness of form works.
    - f) Construction joint (wherever applicable) is properly prepared.
    - g) Side supports / restraints for the form work are enough and robust.
    - h) That all wedges are secured and firm in position.
    - i) That provision is made for traffic on formwork not to bear directly on reinforcing steel.
    - j) Pouring platform along with its approach from ground is robust and safe for worker's movement
    - k) Arrangement for vibrators for compaction of concrete
    - l) Sequence of concrete pouring is well defined and is agreed upon by the Engineer and is explained to concrete pouring team m.
    - m) The Pouring area is well lit.
    - n) Curing arrangements are well planned and agreed upon by the Engineer.
    - o) The green concrete protection measures from sun & rain etc. are in place.

**Note: Contractor shall make above arrangements at his own cost and no extra payment shall be made to contractor for the same.**

- x The Contractor shall obtain the Engineer's approval for dimensional accuracies of the work and for the general arrangement of propping and bracing. (IS: 3696 -Safety Code of Scaffolds and Ladders, IS: 4014 Steel Tubular Scaffolding I & II). All scaffolding and staging shall be either of steel tubes or built up section of rolled steel with adequate bracing at several levels in each perpendicular direction connecting

each prop. In addition to this diagonal bracing should be provided in elevation ideally at 45 degrees or between 30 and 60 degrees. The Contractor shall be entirely responsible for the adequacy of propping, and for keeping the wedges and other locking arrangements undisturbed through the decentring period. (IS: 8989 Safety code for erection of concrete framed structures) and cost of the propping and staging shall be inclusive of the quoted cost for the RCC works in BOQ.

- xi Formwork shall be continuously watched during the process of concreting. If during concreting any weakness develops and formwork shows any signs of distress, the work shall be stopped and remedial action as directed by the engineer shall be taken.
- xii Staging for portal girder and cross girder (in station zone) shall be in the form of portal frame. It shall be ensured that minimum two lanes of traffic with a restricted height of 5.5m can ply underneath it with adequate protection to portal legs from moving traffic. All necessary permissions for the height restrictions on the existing highways, main road, etc., shall be taken by the contractor from the local authorities at his own peril.
- xiii For concourse floor (if any) over road, the contractor shall design and fabricate prefabricated type of staging and shuttering which can be erected in very short duration. Such erection will be only permitted in the night. In such case staging has to span the full width of the road in a portal shaped profile as shown in tender drawings. The portal frame shall have 5.5m (min) traffic clearance from the road for allowing safe movement of traffic below. In case no road runs beneath the concourse zone of station, the bidder may decide whether to use the above form of staging or any normal staging arrangement from the ground itself. All necessary permissions for the height restrictions on the existing highways, main road, etc., shall be taken by the contractor from the local authorities at his own peril.

#### 4.9 Concrete Finishes:

This section deals with the surface of concrete on which forms had been fixed while concreting.

##### i. Formed Surface:

Allowable deviation from plumb or level and from the alignment profile, grades and dimensions shown on the drawings is defined as "tolerance" and is to be distinguished from irregularities in finishes as described herein. Tolerances in concrete construction are specified elsewhere.

The classes of finish and requirements for finishing of concrete surface shall be as shown on the drawings or as hereinafter specified. In the event of finishing not being definitely specified herein or in the drawings, finishes to be adopted shall be as directed by the Engineer.

Completed concrete surface shall be tested, where necessary to determine whether surface irregularities are within the limits specified hereinafter.

Surface irregularities are classified as "Abrupt" or "Gradual". Offsets caused by displaced or misplaced form sheathing, or form sections or by loose knots or otherwise defective timber form will be considered as abrupt irregularities, and shall be tested by direct measurements. All other irregularities shall be considered as gradual irregularities and will be tested by use of template, consisting of a straight edge or the equivalent thereof for curved surfaces. The length of the template shall be 150 cm for testing of formed surfaces and 300 cm for testing of unformed surfaces.

The classes of finish for formed concrete surfaces are designated by one of the symbols F1, F2, F3 and F4. Unless otherwise specified or indicated on drawings, these classes of finish shall apply as follows:

**Finish F1:** This finish applies to surfaces where roughness is not objectionable, or surface that will otherwise be permanently concealed. Surface treatment shall be the repair of defective concrete, correction of surface depressions deeper than 25 mm and filling of tie rod holes. Form sheathing will not leak mortar when concrete is vibrated. Forms may be manufactured with a minimum of refinement.

**Finish F2:** This finish is required on surfaces permanent/ but not prominently exposed to public view for which other finishes are not specified except F1. Forms shall be manufactured in a workmanlike manner to the required offsets or bulges. Surface irregularities shall not exceed 5mm for abrupt and 8mm for gradual irregularities measured with a 1.5 m template.

**Finish F3:** This finish is required for coarse textured concrete surfaces intended to receive plaster, stucco or wainscoting. Surface irregularities shall not exceed 5mm for both abrupt and gradual irregularities.

**Finish F4:** This finish is designated for surfaces prominently exposed to public view where appearance is also of special importance. This shall include piers of viaducts, beams, parapets, railings and decorative features on the structure and on the viaduct and stations. To meet with requirements for F4 finish, forms shall be manufactured in a skilful, workmanlike manner, accurately to dimensions. There should be no visible offsets, bulges or misalignment of concrete. At construction joints, the forms shall be rightly set and securely anchored close to the joint. Abrupt and gradual irregularities shall not exceed 3mm. Irregularities exceeding this limit shall be reduced by grinding to a level of 1:20 ratio of height to length. Jute bag subbing or sand blasting shall not be used.

ii. **Unformed Surfaces:**

The classes of finish for unformed surfaces are designated by symbols U1, U2, U3 and U4. Unless otherwise specified or indicated on drawings, these classes of finish shall apply as follows:

**Finish U1:** This finish applies to unformed surfaces that will be concealed permanently or otherwise where a screeded surface finish meets the functional - requirements. Finish U1 is also used as the stage of finishes for U2 and U3. Finishing operations shall consist of sufficient levelling and screeding to produce an even uniform surface. Surface irregularities shall not exceed 10mm.

**Finish U2:** This is floated finish and used on all outdoor, unformed surfaces. Finish U2 is also used as the second stage of finish for U3. Floating to be performed manually or mechanically on stiffened screed surface shall be minimum to produce textured surface so as to perform effective trowelling. If finish U3 is to be applied, floating shall be continued till a small amount of mortar without excess water is brought to the surfaces so as to be effective trowelling. Surface irregularities shall be removed as directed by the Engineer.

**Finish U3:** This is a trowelled finish and shall be used for tops of parapets etc. prominently exposed to view. When the floated surface has hardened sufficiently, steel trowelling shall be started. Steel trowelling on hardened, floated surface shall be performed with firm pressure to produce a dense uniform surface free from

blemishes and trowel marks and having slightly glossy appearance. Surface irregularities shall not exceed 5mm.

**Finish U4:** This is a steel-trowelled finish, similar to finish U3, except that light surface pitting and light trowel marks such as obtained from the use of machine trowelling will be acceptable, provided that surface irregularities do not exceed the limits specified for finish U3.

Unformed surfaces which are nominally level shall be sloped for drainage as shown on drawings or as directed by Engineer unless the use of other slopes or level surface is indicated on drawings. Narrow surfaces such as tops of parapets, walls and kerbs shall be sloped approximately 1cm per 30cm of width. Broader surface such as roadways, platform and decks, shall be sloped approximately half centimetre per 30cm of width. Finishes of floor and roof slabs shall be sloped, if required, by the Engineer.

#### 4.10 **Exposed Concrete Work:**

Exposed concrete surfaces shall be smooth and even originally as stripped without any finishing or rendering. Where directed by the Engineer, the surface shall be rubbed with Carborundum stone immediately on striking the forms. The Contractor shall exercise special care and supervision of formwork and concreting to ensure that the cast members are made true to their sizes, shapes and positions and to produce the surface patterns desired. No honeycombing shall be allowed. Honeycombed parts of the concrete including the surface defects in the concrete shall be removed by the Contractor without affecting the strength of adjoining concrete as directed by the Engineer and fresh concrete placed without extra cost, as instructed by the Engineer. Part of defective concrete thus removed shall be re-cast using fresh concrete of same grade or approved quality concrete repair material depending upon the size, location, thickness of the defective concrete and structural behaviour of the member having defective concrete as instructed by the Engineer without extra cost. For the purpose the Contractor shall prepare a comprehensive work procedure and get it approved from the Engineer. Nothing extra shall be paid for repair of the concrete. Contractor shall ensure that no air bubbles are formed on the exposed surface. Concrete pouring sequence, vibration methodology etc. shall be planned to avoid air bubbles. All materials, sizes and layouts of formwork including the locations for their joints shall have prior approval of the Engineer.

#### 4.11 **Age of Concrete at Removal of Formwork:**

Age of Concrete at the time of removal of formworks shall be in accordance with CPWD specifications 2019 or IS: 456. The Engineer may vary the periods specified if he considers it necessary. Immediately after the forms are removed, they shall be cleaned with a jet of water and a soft brush.

#### 4.12 **Stripping of Formwork:**

The work of form work removal should be planned and a definite scheme of operation worked out. Formwork shall be removed carefully without jarring the concrete and curing of the concrete shall be commenced immediately. Concrete surfaces to be exposed shall, where required by the Engineer, be rubbed down with Carborundum stone or bush-hammer to obtain a smooth and even finish. Where the concrete requires plastering or other finish later the concrete surface shall be immediately hacked lightly all over as directed by the Engineer. No extra charge will be allowed to the Contractor for such work on concrete surfaces after removal of forms.

#### 4.13 **Reuse of Forms:**

The Contractor shall not be permitted reuse of plywood formwork brought new on the works more than 5 times for exposed concrete formwork and 8 times for ordinary

formwork. 5 or 8 uses shall be permitted only if forms are properly cared for, stored and repaired after each use. The Engineer may in his absolute discretion order rejection of any forms he considers unfit for use for a particular item irrespective of no of times the shuttering has been used and order removal from the site of any forms he considers unfit for use in the Works. Used forms brought on the site will be allowed proportionately fewer uses as decided by the Engineer. Use of different quality boards or the use of old and new boards in the same formwork shall not be allowed. If any other type of special or proprietary form work is used, the no. of times they can be used will be determined by the Engineer.

#### 4.14 **Formwork for Precast/ Restressed Concrete:**

The provisions in this section shall be considered supplementary to the general provisions stated above and additional Technical Specifications for pre cast segments. Precast concrete members and panels shall be made in accurately constructed moulds, on a properly prepared casting bed. All aspects of the making, curing and erection of precast units shall be subject to the approval of the Engineer. The contractor shall submit detailed drawings of formwork for the approval of the Engineer. Finishing with cement mortar shall not be allowed.

The formwork should be so designed that it does not restrain the shrinkage movements and possible shortening due to pre-stress of the concrete. The formwork shall be of sturdy construction with special considerations to shutter vibrators when used. All edges and joints of the formwork should be designed and sealed so that no cement grout can escape and there is no wedging or keying to the concrete. The effect of curing on the formwork should be given special consideration. Depending on care, curing erection and maintenance after stripping, the following number of/ uses can be made with different types of formwork.

Plywood with timber backed formwork - As per satisfaction of Engineer

Steel moulds

-do-

No of uses of shuttering shall be as per approval of the Engineer. In cases where concrete moulds can be satisfactorily provided by the contractor, the Engineer's approval shall be obtained before use on the works.

#### 4.15 **Stripping:**

As soon as the precast units have attained sufficient strength, the formwork shall be stripped. The precast unit shall be lifted uniformly out of the formwork without being subjected to tilting or restraint effects or any other stresses and as per the guidelines issued by Engineer or his authorised representative.

If proprietary system of form work is used, detailed information as given in Annexure 4.1 shall be furnished to Engineer for approval before use.

#### 4.16 **Measurements (Not applicable for Schedule B):**

Unless stated otherwise, the rate for concrete in plain concrete, reinforced concrete or in pre-stressed concrete shall be deemed to include the cost of all formwork / shuttering, staging, launching etc.

**ANNEXURE 4.1****Information to be Supplied by Manufacturers of Proprietary Systems of Formwork****1. General**

- 1.1 The information which the manufacturer is required to supply shall be in such detail as to obviate unsafe erection and use of equipment due to the intention of the manufacturer not having been made clear or due to wrong assumptions on the part of the user.
- 1.2 The user shall refer unusual problems of erection/assembly not in keeping with intended use of equipment, to the manufacturer of the equipment.

**2. Information Required**

- 2.1 The manufacturers of proprietary systems shall supply the following information;
- a. Description of basic functions of equipment.
  - b. List of items of equipment available, giving range of sizes, spans and such like, with manufacturer's identification number or other references.
  - c. The basis on which safe working loads have been determined and whether the factor of safety given applies to collapse or yield.
  - d. Whether the supplier's data are based on calculations or tests. This shall be clearly stated as there may be wide variations between results obtained by either method.
  - e. Instructions for use and maintenance, including any points which require special attention during erection, especially where safety is concerned.
  - f. Detailed dimensional information, as follows:
    - i. Overall dimensions, depths and widths of members.
    - ii. Line drawings including perspectives and photographs showing normal uses.
    - iii. Self-weight.
    - iv. Full dimensions of connections and any special positioning and supporting arrangements.
    - v. Sizes of members, including tube diameters and thicknesses of material.
    - vi. Any permanent camber built into the equipment.
    - vii. Sizes of holes and dimensions giving their positions.
    - viii. Manner of fixing including arrangements for sealing joints.
    - ix. Method of de-stripping, storing & shifting.

Data relating to strength of equipment as follows:

- i. Average failure loads as determined by tests.
- ii. Recommended maximum working loads for various conditions of use.
- iii. Working resistance moments derived from tests.
- iv. Working shear capacities derived from tests.
- v. Recommended factor of safety used in assessing recommended loads and deflections based on test results.
- vi. Deflections under load together with recommended pre-camber and limiting deflections.



- vii. If working loads depend on calculations, working stresses should be tested. If deflections depend on theoretical moments of inertia or equivalent moments of inertia rather than tests, this should be noted.
- viii. Information on the design of sway bracing against wind and other horizontal loadings.
- ix. Allowable loading relating maximum extension of bases and/or heads.

Any restrictions regarding usage of any component or full assembly with regard to spans, heights and loading conditions.

**S.05: REINFORCEMENT****5.1 General**

These specifications shall be read in conjunction with the CPWD specifications 2019 with upto date correction slips, MOST/MORTH Specifications and other relevant specifications described in the S.01 of Section-VII-F of these specifications.

High strength deformed steel bars for concrete reinforcement used in the works shall be Fe 500D TMT or higher grade, conforming to IS 1786. Steel specified for reinforcement shall conform in every respect to the latest relevant Indian Standard Specifications and shall be of tested quality under the ISI Certification Scheme.

All reinforcement work shall be executed in conformity with the drawings supplied and instructions given by the Engineer and shall generally be carried out in accordance with the relevant Indian Standard Specifications IS: 2502 Bending and Fixing of Bars for Concrete Reinforcement.

The reinforcement steel shall be from primary producers from the approved vendor list and no re-rolled steel shall be supplied/used. The Contractor shall produce copy of original challan or voucher as a proof of having purchased the steel reinforcement from manufacturers or their authorised distributors having approval of the Engineer.

Procurement of reinforcement steel shall be so phased by the Contractor that the storage period before its actual use in the works is limited to the bare minimum as directed by the Engineer.

In order to offer adequate resistance against corrosion, reinforcement bars shall be provided with a coating of " Truncated Inhibited Cement Slurry (Patent No. 109784/67 of CECRI, Karaikudi)" for non-aggressive environments (Mild and Moderate). **No extra payment shall be made for the same.**

**5.2 Inspection & Testing:**

Manufacturer's test certificate steel shall be submitted for each lot of supply brought at Site of work by the Contractor. The reinforcement shall be tested as per IS 1786-2008. However, the sampling of the same shall be as laid down in the CPWD specification 2019 with latest correction slips. The cost of the same is deemed to be included in the contract price and nothing extra shall be payable to the contractor in this regard. Every bar shall be inspected before assembling on the works and any defective, brittle, excessively rusted or burnt bars shall be removed. Cracked ends of bars shall be cut out.

Batches shall be rejected if the results of each batch are not in accordance with the specifications.

Every consignment of steel brought to the site of works for use in reinforced concrete work, shall be accompanied by a certificate from the manufacturer giving the following details:

- a) Place of manufacture of the reinforcing steel,
- b) Nominal diameter of the steel,
- c) Grade of the steel,
- d) Rolled-in marking on the steel,
- e) Cast/heat number,
- f) Date of testing,
- g) Mass of the tested lot, and

h) Individual test results for all the properties,

All such certificates shall be deposited with the Engineer- in -Charge for his record and reference.

### **5.3 Bar bending and Bar Bending Schedule:**

All bars will be carefully and accurately bent by approved means in accordance with IS: 2502, and relevant drawings. It shall be ensured that depth of crank is correct as per the bar cutting and bending schedule and bent bars are not straightened for use in any manner that will injure the material.

Prior to starting bar bending work, the Contractor shall prepare bar bending schedule from the structural drawings supplied to him and get the same approved by Engineer. No work shall commence before the approval of Engineer for the same. Any discrepancies and inaccuracies found by the Contractor in the drawings shall be immediately reported to the Engineer whose interpretation and decision there to, shall be accepted.

### **5.4 Lapping & Welding:/Mechanical Splicing**

As far as possible, bars of the maximum length available shall be used. Laps shown on drawings or otherwise specified by the Engineer will be based on the use by the Contractor of bars of maximum length. In case the Contractor wishes to use shorter bars, laps/couplers (approved make with permission of Maha Metro) shall be provided in the manner and at the locations approved by the Engineer. No extra payment shall be made for reinforcement lapping. In case the Contractor wishes to use shorter bars, laps shall be provided at the Contractor's cost in the manner and at the locations approved by the Engineer. Use of Mechanical couplers for splicing is not permitted. However, under exceptional cases, it may be allowed with the prior approval of Engineer-in-Charge purely on case-to-case basis and no extra payment shall be made for the same.

Welding in lieu of lap is not permitted unless specified in the drawings or as instructed by the Engineer.

### **5.5 Spacing, Supporting and Cleaning:**

- i. All reinforcement shall be placed and maintained in the positions shown on the drawings to be prepared by contractor.
- ii. The Contractor shall provide approved types of supports for maintaining the bars in position and ensuring required spacing and correct cover of concrete to the reinforcement as specified on the drawings. Cover blocks of required shape and size, chairs and spacer bars shall be used to ensure accurate positioning of reinforcement. Cover blocks shall be cast well in advance and shall consist of approved proprietary pre-packaged free flowing mortars (Concentra HF of Fosroc or equivalent). They shall be circular in shape for side cover and square for bottom cover. The cost of cover blocks and Chairs/spacer bars shall be deemed to have been included in the rates/contract price.
- iii. Bars must be cleaned, before concreting commences, of all scale, rust or partially set concrete which may have been deposited there during placing of previous lift of concrete. Any reinforcement which is certified as corroded by the Engineer shall be removed from the site.
- iv. 18 gauge G.I. wire shall be used for binding reinforcement as well as for tying cover blocks with reinforcement. The cost of gauge wire is deemed to have been included in the rate quoted by the contractor.

**5.6 Welding (If specific approval from Engineer is granted):**

- i. Wherever specified all lap and butt welding of bars shall be carried in accordance with IS: 2751. Only qualified welders duly tested and certified shall be permitted to carry out such welding.
- ii. For cold twisted reinforcement, welding operations must be controlled to prevent a supply of large amounts of heat larger than that can be dissipated. The extreme non-twisted end portion shall be cut off before welding. Electrodes with rutile coating should be used.
- iii. Bars shall be free from rust at the joints to be welded.
- iv. Slag produced in welding after alternative run should be chipped and removed by brush.
- v. Electrode should not be lighted by touching the hot bar.
- vi. The welding procedure shall be approved by the Engineer and tests shall be made to prove the soundness of the welded connection.
- vii. E7018 electrode shall be used for Fe415 grade and E8018 electrode shall be used for Fe500D and above as per AWS (American Welding Society) standards.

**5.7 Measurement (Not applicable for Schedule B):**

- i. The measurement shall be done by weight in MT based on bar bending schedule. Payment of reinforcement steel shall be made for the length of the reinforcement bars of different diameter as per approved bending schedule (to be prepared by the contractor on the basis of approved drawing). In case the actual reinforcement provided in any member is less than the quantity calculated based on drawings/ bar bending schedule (with the approval of engineer), the same shall be adjusted for the purpose of payment.
- ii. No additional payment will be made for any welding operations carried out on reinforcement bars and providing mechanical couplers. Laps of all types, chairs, spacers, bend correction deduction as per SP 34 etc., as required are deemed to be included in the quoted rate and nothing extra is payable on this account. Payments shall not be made for lapping/welding and reinforcement bars used for lifting, hooks, handling, etc., as cost towards these is deemed to be included in the accepted rate of the item.

**5.8 Protective Coating of Reinforcement bars using Truncated Inhibited Cement Slurry:**

The protective coating of reinforcement bars shall conform to IS 9077 and CECRI it shall be approved by the Engineer in Charge.

The reinforcement bars should be dipped in the derusting solution of approved quality and the bars removed as soon as the rust is satisfactorily removed and a bright surface is obtained. This should be immediately followed by cleaning the bars with wet waste cloth and alkaline cleaning powder.

The bars should then be brushed with the phosphate jelly of approved quality by means of fibre brush. The jelly should be left on the surface for a period of 45- 60 minutes and then removed by means of wet waste cloth. This should be followed by brushing the inhibitor solution of approved quality and the first coat of cement slurry, prepared by mixing 500 cc of inhibitor for each 1000 gm of Portland cement. All the above steps should be applied in the same day and after 12-24 hours of air-drying, the sealing solution of approved quality should be brushed followed by the second coat of cement slurry.

It should then be dried for 12-24 hours followed by a brush coat of the sealing solution which should be applied again after 4 hours of air-drying.

Briefly following steps shall invariably be followed in use of Inhibitor solution:

- a) Derusting by dipping the rebars in pickling solution (patent no.465/CAL/75) for 30 minutes (pH of the solution is 1.04)
- b) Removal from acid tank and dipping in alkaline tank to neutralize and cleaning with potable water for 2 minutes.
- c) Application of phosphate jelly coat (Patent no. 109897) and drying for 45-60 minutes (pH of the jelly is 2.5).
- d) Application of inhibitor solution A (patent no. 109784/67) for 2 minutes.
- e) Application of first coat of cement slurry coating with inhibitor solution A
- f) Air drying for 24 hours.
- g) Application of first coat of sealing solution B (Patent no. 112440/67) for 2 minutes.
- h) Application of 2nd coat of cement slurry solution A for 2 minutes.
- i) Air drying for 24 hours
- j) Another coat of sealing solution B and drying for 4 hours.
- k) Application of 3rd coat of sealing solution B for 2 minutes
- l) Air drying for 4 hours.

Detailed specification regarding quality control aspects and chemicals/solutions used in the process may be obtained from Central Electro Chemical Research Institute (CECRI) Karaikudi- 623 006 (Tamandu).

**No extra payment shall be made for the protective coating procedure mentioned above and cost of the same shall be deemed to be included in the contract price.**

**S.06: PRESTRESSED CONCRETE**

Structural concrete containing prestressed steel reinforcement to introduce pre-compression is termed as prestressed concrete.

**6.1 General**

The work shall be carried out in accordance with the drawings and these specifications or as approved by the Engineer.

Concrete and un-tensioned steel for the construction of pre-stressed concrete members shall conform to the requirements of sections respectively in so far as the requirements of these Sections apply and are not specifically modified by requirements set forth herein.

Contractor shall ensure that different components of pre-stressing system such as jacks, bearing plates, wedges, anchorages, strands and HDPE ducts are compatible to each other and the data regarding the same shall be exchanged in between all the suppliers to ensure the same.

**6.2 Materials****A. Sheathing**

Material for all pre-stressing sheathing duct shall be HDPE in the form of corrugated. The thickness of the HDPE sheathing ducts shall conform to IRS Concrete Bridge Code-1997 & IRC -112:2020).

- i. The minimum wall thickness of the duct as manufactured shall be 2.0 mm, 2.5 mm, 3.0 mm and 4.0 mm for ducts of internal diameter upto 50 mm, 85 mm, 100 mm and 125 mm respectively. Linear interpolation may be done for any intermediate values.
- ii. Tolerance for duct diameter is  $\pm 1\%$  or  $\pm 1$  mm, whichever is greater. Tolerance for wall thickness shall be  $-0/+0.5$  mm.
- iii. The minimum residual wall thickness after loss in the compression test as per clause B1-2 at Appendix B1 of IRS CBC-1997 with latest correction slips, shall not be less than 1.5 mm for ducts upto 160 mm outer Diameter.
- iv. The material for the ducts shall be high-density polyethylene with more than 2 percent carbon black to provide resistance to ultra-violet degradation and shall have the following properties as mentioned in table below unless otherwise specified:

Property	Unit	Applicable Standard	Temperature	Acceptance Values	
				Min	Max
Carbon content	%			2	
Density	gm/cc	IS2530	23 ° C	0.94	0.96
Tensile strength at Yield	MPa	BS EN ISO 527-3		20	
Shore 'D' Hardness		IS 13360 (Part 5 /Section 11)		a) 3 Sec b) 15 Sec	: 60 : 58
Elongation at Yield	%	BS EN ISO 527-3		7	
Melt Flow Index (MFI)	g/10 minutes	IS:2530	190 ° C under a mass of 5 kg	0.5	1.2
Environmental Stress Crack	Hrs	ASTMD-1693	70 ° C	192	

Resistance					
Coefficient of Thermal Expansion for 20 °C - 80 °C	/ ° C	DIN 53 752		1.50x10 <sup>-4</sup>	
Charpy impact strength of notched specimen (i) at 23 ° C (ii) at -40 ° C	kJ/m <sup>2</sup>	BS EN ISO 179		1.0kJ/m <sup>2</sup> 4 kJ/m <sup>2</sup>	

- v. The ducts shall be corrugated on both sides. The duct shall transmit full tendon strength from the tendon to the surrounding concrete over a length not greater than 40 duct diameters. Material and formulation of sheathing ducts shall conform to test and acceptance criteria of IRC-112:2011.
- vi. The sheaths shall be sufficiently watertight to prevent concrete laitance penetrating in them in quantities likely to increase friction. Special care shall be taken to ensure water-tightness at the joints
- vii. The alignment of all sheaths and extractable cores shall be correct to the requirements of the drawings and maintained securely to prevent displacement during placement and compaction of concrete. The permissible tolerance in the location of the sheaths and extractable cores shall be 5 mm. Any distortion of the sheath during concreting may lead to additional friction.
- viii. Sheathing ducts shall be joined by adopting any one or more of the following methods, as convenient to suit the individual requirements of the location, subject to satisfactory pressure tests before adoption and approval of Engineer.
  - Using Corrugated threaded sleeved couplers which can be tightly screwed together with male and female threads
  - Jointing with thick walled HDPE shrink couplers with glue. This can also be used for connection with trumpet etc.
  - Welding with electro fusion couplers/Heat Shrink Couplers.
- ix. The joints shall be able to withstand an internal pressure of 0.5 bar (0.05 Mpa) for 5 minutes as per water loss test procedure given in Clause-B-7at Appendix-B of IRS Concrete Bridge Code- 1997
- x. The initial acceptance tests such as bond test, compression test for loss of wall thickness are required to be performed as part of acceptance criteria for system.
- xi. In addition to above, the HDPE ducts supplier must have conducted friction test at least once as given in FIP bulletin No-7 to establish/confirm the friction values (K & u) using the HDPE ducts produced by them, submit the test details and obtain approval prior to commencing supplies.
- xii. The routine test such as workability test, transverse load rating test, tension load test and water loss test shall be applicable for both post threading and pre - threading system of cables.
- xiii. Loads to be imparted on the 107mm ID sheathing during transverse load rating test and tension load test shall be extrapolated from values given for smaller dia sheathing as per IRC 112:2020 with latest amendments. At least 3 samples for one lot of supply (not exceeding 7000-meter length) shall be tested.

- xiv. In viaduct constructed by precast segmental construction, cables shall be threaded after application of temporary prestressing.
- xv. In such cases a temporary flexible PVC/HDPE tube of suitable O.D shall be homed through sheathing which will provide adequate stiffness to sheathing during concreting and also prevent blockage of sheathing in case of possibility of leakage. The temporary PVC/HDPE tube shall be pulled out before threading of the permanent cables.

## **B. Anchorages**

- I. Anchorages shall be procured from authorized manufacturers only. Anchorages shall conform to BS: 4447.

Load transfer test and anchorage efficiency shall be conducted as defined in FIP-1993.

Engineer- in-charge shall select at random, the required anchorages / wedges sample from completed lots for testing by the manufacturer.

The concrete unit of required size/R/F will be made by contractor using same design mix of concrete which will be required for the load transfer test.

The load transfer test shall be conducted only when the concrete unit attains sufficient strength required for stressing activity as proposed in the drawings.

No damaged anchorages shall be used. Steel parts shall be protected from corrosion at all times. Threaded parts shall be protected by greased wrappings and tapped holes shall be protected by suitable plugs until used. The anchorage components shall be kept free from mortar, loose rust and any other deleterious coating.

After completion of pre-stressing and grouting of cables in PSC members, the extra length of stressed strands projecting outside the anchorage are required to be cut as per approved methodology and the anchorage ends are to be sealed as per the relevant specifications approved by Engineer-in-Charge.

- II. Swages of prestressing strand shall develop strength of at least 95 per cent of the specified breaking load of the strand.

III. Untensioned steel reinforcements, around anchorages shall be furnished by prestressing system supplier. Requirement of the same should be job specific and based on edge distance of anchorage and strength of concrete at the time of stressing of cables as defined in drawings. The same R/F shall be provided in unit required for load transfer test.

Minimum 3 tests each are required to be conducted for load transfer test and anchorage efficiency test.

The manufacturer shall complete the required testing and determine compliance of the obtained results with FIP-1993 recommendations before transporting the lot to site.

## **C. Prestressing Steel**

- i. Uncoated, stress relieved, low relaxation steel conforming to IS: 14268:2017, class - 2 shall be used. Nominal dia shall be 15.2 mm with



minimum breaking strength of 260.7 KN and minimum 0.2 % proof load of 234.6 KN.

- ii. Various test as recommended in IS: 14268 shall be conducted before transporting the lot to site. Apart from 1000 hrs relaxation test conducted by manufacturer, at least two such tests are required to be conducted by approved independent (third party) agency in the beginning of project.
- iii. All strands to be transported to the site shall be assigned a lot number and tagged for identification purposes.

#### **D. Prestressing Strands/Wires Storage**

All high tensile steel for prestressing work shall be stored about 30 cm above the ground in a suitably covered and closed space to protect it from dampness. It shall also be invariably wrapped in gunny cloth or tar paper or any other suitable material, as per approval of Engineer. Even if it is to be stored in an area at the site for short time during transit it shall be suitably covered. Protection during storage and repacking or application of washable protective coating to the H.T. steel shall be given by the contractor at no extra cost, if the packing of H. T. Strands/wires during unloading and storage / handling in the stores gets damaged.

Stock piling of HTS wires on the work site shall not be allowed any time, especially before and during the monsoon.

Engineer-in-Charge or his authorized representative shall always have an easy access to the store-yard for inspecting the H. T. Wires/strands/Bars and satisfying themselves regarding the condition thereof. Any modifications regarding storage suggested by Engineer shall scrupulously be followed by the contractor. During monsoon days, H.T wires/strands shall be kept in a reasonably air tight store, if required by the Engineer, at no extra cost.

#### **6.3 Testing of Prestressing Steel and Anchorages**

All strand from each manufactured reel and all bars of each size from each mill heat to be shipped to the site shall be assigned a lot number and shall be tagged in such a manner that each lot can be positively identified at the job site. Each reel of prestressing reinforcement shall be accompanied by a manufacturer's certificate of compliance, a mill certificate, and a test report. Samples from each size and each heat of prestressing bars and from each manufactured reel of prestressing steel strand shall be furnished to the Engineer for testing.

Samples shall be submitted in ample time to allow for testing, for tabulating results and, if necessary, in case of unsatisfactory finds, to call for and retest substitute samples. The Contractor shall have no claim for additional compensation because of delay while awaiting approval of the materials furnished for testing.

- i. Testing of Prestressing Steel as per IS 14268:2017 is included in the scope of work. Nothing Extra shall be payable in this regard.
- ii. All materials specified for testing shall be furnished free of cost and shall be delivered in time for tests to be made well in advance of anticipated time of use.
- iii. Anchorage assemblies to be transported shall be like-wise identified.
- iv. All samples submitted shall be representative of the lot to be furnished and in the case of strands, samples shall be taken from the same master roll. The Contractor shall furnish samples of at least 5.0m length selected from each lot

for testing. Also, two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be furnished along with short lengths of strands as required.

#### **6.4 Workmanship**

##### **A. Cleaning**

Tendons shall be free from loose rust, oil, grease, tar, paint, mud or any other deleterious substance.

Cleaning of the high tensile steel wires may be carried out by immersion in suitable solvent solutions, wire brushing or passing through a pressure box containing Carborundum powder. However, the tendons shall not be brought to a polished condition.

##### **B. Straightening**

High tensile strands shall be supplied in coils of sufficiently large diameter such that tendons shall retain their physical properties and shall be straight as it unwinds from the coil. Tendons of any type that are damaged, kinked or bent shall not be used.

The packing of prestressing strands shall be removed only just prior to making of cable for placement. Suitable stands shall be provided to facilitate uncoiling of strands without damage to steel. Care shall be taken to avoid the possibility of steel coming into contact with the ground.

##### **C. Positioning**

###### **I. Post-Tensioning**

- i. Prestressing tendons shall be accurately located and maintained in position, both vertically and horizontally, as per drawings.
- ii. Tendons shall be so arranged that they have a smooth profile without sudden bends or kinks. The location of prestressed cables shall be such as to facilitate easy placement and vibration of concrete in between the tendons.
- iii. Sheathing shall be placed in correct position and profile by providing suitable ladders and spacers. Such ladders may be provided at intervals of approximately 1.0 m. Sheathing shall be tied rigidly with such ladders/spacer bars so that they do not get disturbed during concreting.
- iv. The method of supporting and fixing shall be such that profile of cables is not disturbed during vibrations, by pressure of wet concrete, by workmen or by construction traffic.

- II. Each anchorage device shall be set square to the line of action of the corresponding prestressing tendon and shall be positioned securely to prevent movement during concreting.

The anchorage devices shall be cleaned to the satisfaction of the Engineer prior to the placing of concrete. After concreting, any mortar or concrete which adheres to bearing or wedging surfaces shall be removed immediately.

Tendons shall be placed only prior to stressing. Tendons shall be handled with care to avoid damage or contamination, to either the tendon or the sheathing. Any

tendons which are damaged or contaminated shall be cleaned or replaced as directed by the Engineer.

**D. Cutting**

Cutting and trimming of H.T.S wires or strands shall be done by suitable mechanical cutters.

In post-tensioning, the ends of prestressing steel projecting beyond the anchorages, shall be cut by suitable means Before grouting operation.

**E. Protection of Pre-Stressing Steel**

Pre-stressing steel shall be continuously protected against corrosion, until grouted. The corrosion protector shall have no deleterious effect on the steel or concrete or on the bond strength of steel to concrete. Grouting shall conform to these specifications or as directed by the Engineer.

**F. Sheathing**

The joints of sheathing pipes shall be water-tight. Special attention shall be paid to the junction at the anchorage end, where the sheathing must tightly fit on the protruding trumpet end of anchorage and thereafter sealed preferably with adhesive water proof tape as per approved manufacturer's specifications.

The sheathing and all joints shall be water tight. Any temporary opening in the sheathing shall be satisfactorily plugged and all joints between sheathing and any other part of the prestressing system shall be effectively sealed to prevent entry of mortar, dust, water or other deleterious matter. Sheathing shall be neatly fitted at joints without internal projection or reduction of diameter.

Sheathing shall be firmly tied so that while concreting they should not float up. Sheathing shall be aligned accurately with respect to vertical and horizontal coordinates (profile).

Enlarged portions of the sheathing at couplings or anchorages shall be of sufficient length to provide for the extension of the tendons.

**G. Grout Vents**

Grout vents of at least 20 mm diameter shall be provided at both ends of the sheathing.

**H. Anchorages**

All bearing surfaces of the anchorages shall be cleaned prior to concreting and tensioning.

Anchor cones, blocks and plates shall be securely positioned and maintained during concreting such that the centre line of the duct passes axially through the anchorage assembly.

The anchorages shall be recessed from the concrete surface as per drawings.

After the prestressing operations are completed and pre-stressing strands are cut, the surface shall be painted with two coats of epoxy of suitable formulation having a dry film thickness of 80 microns per coat and entire recess shall be filled with concrete or non-shrink/pre-packaged mortar or epoxy concrete as approved by Engineer-in-Charge.

## **6.5 Supervision**

All pre-stressing and grouting operations shall be undertaken by trained and qualified personnel only.

All prestressing accessories shall be procured from authorized manufacturers with in-house testing facilities. The Contractor shall be required to engage specialized agencies who should also be entrusted with the total service contract for fabrication of cables to required Length, protection of cables during concreting, prestressing and grouting.

Necessary certificates shall be accorded by such specialized agencies that the work has been carried out in accordance with prescribed specifications.

A representative of supplier of the pre-stressing system shall be present during all tensioning and grouting operations and shall ensure, monitor and certify their correctness.

## **6.6 Tensioning Equipment**

All tensioning equipment shall be procured from authorized manufacturers only and shall be approved by the Engineer prior to use. Where hydraulic jacks are used, they shall be power-driven unless otherwise approved by the Engineer. The tensioning equipment shall satisfy the following requirements:

- (i) The means of attachments of the pre-stressing steel to the jack or any other tensioning apparatus shall be safe and secure.
- (ii) Where two or more wires/strands constitute a tendon, a single multi pull stressing jack shall be used, which is capable of tensioning simultaneously all the wires/strands of the tendon. Suitable facilities for handling and attaching the multi-pull back to the tendons shall be provided.
- (iii) In special cases where usage of multistrand jack is not feasible, Contractor may use mono strand jack on specific approval of Engineer.
- (iv) The tensioning equipment shall be such that it can apply controlled total force gradually on the concrete without inducing dangerous secondary stresses in steel, anchorage or concrete;
- (v) Means shall be provided for direct measurement of the force by use of dynamometers or pressure gauges fitted in the hydraulic system itself to determine the pressure in the jacks. Facilities shall also be provided for the linear measurement of the extension of prestressing steel to the nearest mm and of any slip of the gripping devices at transfer

All dynamo meters and pressure gauges including a master gauge shall be calibrated by approved laboratory immediately prior to use and then at intervals not exceeding 3 months and the true force determined from the calibration curve.

Pressure gauges shall be concentric scale type gauges accurate to within two per cent of their full capacity. The minimum nominal size of gauge shall be 100 mm. The gauge shall be so selected that when the tendon is stressed to 75 per cent of its breaking load, the gauge is reading between 50 percent and 80 percent of its full capacity. Suitable safety devices shall be fitted to protect pressure gauges against sudden release of pressure.

Provision shall be made for the attachment of the master gauge to be used as a check whenever requested for by the Engineer.

Jack efficiency test shall be conducted at supplier's factory as well as at site prior to first use at site and then at intervals not exceeding three months

Pump shall be calibrated from an approved laboratory prior to use and then at intervals not exceeding three months.

#### **6.7 Post Tensioning**

Tensioning force shall be applied in gradual and steady steps and carried out in such a manner that the applied tensions and elongations can be measured at all times. The sequence of stressing, applied tensions and elongations shall be in accordance with the approved drawing or as directed by the Engineer.

It shall be ensured that in no case, the load is applied to the concrete before it attains the strength specified on the drawing or as stipulated by the pre-stressing system supplier, whichever is more.

After pre-stressing steel has been anchored, the force exerted by the tensioning equipment shall be decreased gradually and steadily as to avoid shock to the pre-stressing steel or anchorage.

The tensioning force applied to any tendon shall be determined by direct reading of the pressure gauges or dynamo-meters and by comparison of the measured elongation with the calculated elongation. The calculated elongation shall be invariably adjusted with respect to the modulus of elasticity of steel and area of strand for the particular lot as given by the manufacturer.

The difference between calculated and observed tension and elongation during prestressing operations shall be regulated as follows:

- a) If the calculated elongation is reached before the specified gauge pressure is obtained, continue tensioning till attaining the specified gauge pressure, provided the elongation does not exceed 1.05 times the calculated elongation. If 1.05 times the calculated elongation is reached before the

specified gauge pressure is attained, stop stressing and inform the Engineer for proper remedial measure.

- b) If the calculated elongation has not been reached at the specified gauge pressure, continue tensioning by intervals of 5kg/sq. cm until the calculated elongation is reached provided the gauge pressure does not exceed 1.05 times the specified gauge pressure. If the elongation at 1.05 times the Specified gauge pressure is less than 0.95 times the calculated elongation, the following measures must be taken, in succession, to determine the cause of this lack of discrepancy:
- I. Check the correct functioning of the jack, pump and leads.
  - II. De-tension the cable. Slide it in its duct to check that it is not blocked by mortar which has entered through holes in the sheath. Re-tension the cable if free.
  - III. Re-establish the modulus of elasticity of steel for the particular lot from an approved laboratory. Contractor may suggest other remedial measure for approval of the Engineer.

If the required elongation is still not obtained, further finishing operations such as cutting or sealing, should not be undertaken without the approval of the Engineer.

When stressing is taken up from one end only, the slip at the end remote from the jack shall be accurately measured and an appropriate allowance made in the measured extension at the jacking end.

A complete record of prestressing operations along with elongation and jack pressure data shall be maintained in the format given in Appendix 1800/II of MOST Specification or as per format approved by Engineer.

Any breakage of individual strand / groups of strands during tensioning shall require immediate de-stressing of all strands and replacement of the all the strands by fresh strands.

## **6.8 Grouting of Pre-Stressed Tendons**

Post tensioned tendons shall be bonded to concrete of the prestressed member as well as protected from corrosion by cement grout which shall fill the ducts fully, without leaving any entrapped air or water pockets, voids created by evaporation of excess water in the grout and bleeding.

Prior to grouting, all cables shall be tested with water pressure of 0.3 MPa for approximately 3 minutes, to investigate leakages and connectivity of ducts.

Since the epoxied joint (in precast segmental construction) is of paramount importance to ensure long-term durability of prestressing cables, this field test shall be taken as an indication of the Contractor's quality of work in general and effectiveness of the epoxy joint executed by him. The approval / rejection of such span shall depend on the decision of Engineer. However, no extra payment shall be made to the contractor for such epoxy injection.

Grouting of pre stressed tendons should be carried out as early as possible but not later than 2 weeks from the date of prestressing. Whenever this stipulation cannot be complied with for unavoidable reason, adequate temporary protection of the steel against corrosion by methods or products which will not impair the ultimate adherence of the injected grout should be ensured till grouting.

All other aspects of grouting of cables shall be governed by latest MORTH-Specification and IRC-112:2020. If there is any discrepancy of clauses between them, IRC 112:2020 shall prevail. A record of grouting operations shall be maintained in the format as given in Appendix 1800/III of MORTH Specifications.

#### **6.9 Safety Precautions during Tensioning**

Care shall be taken during tensioning to ensure the safety of all persons in the vicinity.

Jacks shall be secured in such a manner that they will be held in position, should they lose their grip on the tendons.

No person shall be allowed to stand behind the jacks or close to the line of the tendons while tensioning is in progress.

The operations of the jacks and the measurement of the elongation shall be carried out in such a manner and such a position that the safety of all concerned is ensured.

A safety barrier shall be provided at both ends to prevent any tendon, which might become loose from recoiling unchecked.

Safety net shall be placed below the End segment during prestressing to avoid any falling of any broken concrete pieces of segment on the road in case of any cracks in End segment during prestressing.

During actual Prestressing operation, warning signs shall be displayed at both ends of tendon and below the jack location at ground level.

After pre-stressing, concrete shall neither be drilled nor any portion cut nor chipped away nor disturbed, without approval of the Engineer.

No welding shall be permitted on or near tendons nor shall any heat be applied to tendons. Any tendon which has been affected by welding, weld spatter or heat shall be rejected.

**6.10 Tolerances**

Permissible tolerances for positional deviation of Pre-stressing tendons in cast-in-situ construction shall be limited to the following

Variation from the specified horizontal profile: 5 mm

Variation from the specified vertical profile: 5 mm

Variation from the specified position in member: 3 mm

**6.11 Transportation and Storage of Unit:**

Precast girders shall be transported in an upright position. Points of support and the direction of reactions with respect to the girder shall approximately be the same during transportation and storage as when the girder is placed in final position.

When members are to be stacked, they shall be firmly supported at such bearing positions as it will ensure that the stresses induced in them are always less than the permissible design stresses. Further, inclined side supports shall be provided at the ends and along the length of a precast girder to prevent lateral movements or instability.

Care shall be taken during storage, hoisting and handling of the precast units to prevent their cracking or being damaged. Units damaged by improper storing or handling shall be replaced by the Contractor at his expense.

**6.12 Tests and Standards of Acceptance**

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

**6.13 DELETED**



#### **6.14 Pre-cast Pre-Tensioned Girders**

##### **General**

This section generally applicable to precast pre-tensioned girder. The precast pretensioned elements shall be cast by the Contractor in the precasting yard. After 28 days of casting, the girders shall be transported to site and erected at appropriate position by the Contractor. The Tenderers are advised to visit the station sites as well as site of proposed precasting yard and assess the physical condition of the route for transportation of the elements. Concrete and untensioned steel for the construction of prestressed concrete members shall conform to the requirements of sections respectively in so far as the requirements of these Sections apply and are not specifically modified by requirements set forth herein.

Contractor shall ensure that different components of prestressing such as jacks, bearing plates, wedges, anchorages, strands and HDPE ducts are compatible to another and the same shall be exchanged in between all the suppliers to ensure the same.

##### **6.14.1 Scope of Work:**

The general scope of work will include:

- i. Providing and placing cement concrete with all ingredients and admixtures if and as required.
- ii. All arrangements needed to keep the reinforcement bars, pretensioned strands and sheathing in position with due spacing & cover blocks
- iii. Providing steel shuttering, staging, scaffolding, erection & eventual removal.
- iv. Providing and placing in position and fixing permanent specialised bearings with the super structure, with their anchor bolts as per detailed specifications/instructions as stipulated, supplemented by manufacturer's specifications and directions of Engineer including grouting of holes etc. if any, with suitable grouts as approved by the Engineer.
- v. Installation of expansion joints in stages over the viaduct deck as per approved drawings and as per manufacturer's specifications/directions of Engineer.
- vi. Fixing/embedding all necessary electrical or other fixtures which shall be supplied by the dept. free of cost at site.
- vii. Providing and mixing cement concrete with all ingredients and admixtures if and as required.
- viii. Casting, curing, with steam/water as necessary, stacking at casting yard including all handling, rehandling and interim storage operations as required for precast girders.
- ix. Loading at casting yard, transportation to site in accordance with the prevailing traffic rules and regulations, unloading and stacking at site for precast girders.
- x. Provision of necessary & suitable packing to maintain the required gap between precast girders.
- xi. Protection of reinforcement, required to be left for Integration of the precast unit with top deck slab cast in place and bending the reinforcement to required shape after precasting & till their embedment in concrete.
- xii. Transporting precast girder to the location of placement, hoisting & placing in correct position, including all handling operations.
- xiii. The operation of placing precast I-girders over brackets/pier arms in specified position including the cost of all operations involved.

- xiv. Fixing/embedding any fixture supplied by the Employer.
- xv. The handling, carriage and storage of HT strands as per manufacturer's specification.
- xvi. The H.T. strands will be procured by the Contractor. The extra pieces of HT strands cut after the stressing of the cable will be the liability/property of the Contractor.
- xvii. Cost of all other items of materials, plants and equipment and works (not specifically excluded above) for proper prestressing operation of the strands in accordance with the provisions contained elsewhere in the tender documents will be included in the cost of this item.
- xviii. Providing/supplying and operating etc. of jacks and power pumps for prestressing, recording of data, tabulating the same in necessary formats for submission. The item will also include corrective measures that may be necessary and required by the Engineer. In case of pre-stressed concrete work, careful consideration shall be given to re-distribution of loads due to pre-stressing.

**a. Construction sequences**

**Sequence of Operations for pre-tensioned girders.**

For pre tensioned girders of standard length, the sequence of operation, starting from erection of formwork, shall be as follows:

- (i) Erection of formwork
- (ii) Placement of reinforcement cage
- (iii) Threading of HT strands from movable bulkhead to fixed anchor through individual casting beds, end shuttering and reinforcement cages. De-bonding tubes are to be placed in position for strands to pass through. The de-bonding tubes shall be 25mm internal dia hollow, rigid HDPE pipes and the same shall be provided as per detailed drawing/approval of engineer without any extra cost.
- (iv) Removal of initial slackness in the strands by using J-20 mono-strand jack or equivalent up to 20KN force.
- (v) Complete the balance pre-stressing by using mono-strand jacks of desired capacity and lock individual strands. Locking plate to be inserted between the movable bulkhead and fixed bulkhead. Mark individual strands for checking the slip of strands.
- (vi) Seal the ends of de-bonding tubes and close the formwork to correct dimension.
- (vii) Pour concrete. Keep test cubes in the same environment as that of the girder concrete.
- (viii) Allow concrete to set for 3-4 hours before steam curing if required is started.
- (ix) Once steam curing (if required) is over as per direction of the Engineer, remove covers and allow the girders to cool to ambient temperature. Test the cubes for determining compressive strength of concrete in girders.
- (x) If adequate compressive strength is obtained, release the strands and check the slip of strands. Releasing shall be done by displacement of one side of the anchor supports, or both supports alternatively. Releasing shall be done on every strands simultaneously. Releasing shall be smooth and progressive. Sudden releasing by rupture is prohibited.

- (xi) Cut the strands, remove the formwork and lift the girders to inspection bay for removal of end plate and bending of projected bars.
- (xii) Cut the projected strands from girder ends and apply epoxy coating to strands. Mark the girders.
- (xiii) Wet curing.
- (xiv) Arrange for stacking, lock handling and transportation to site.

**b. Concreting for Precast Girders**

Unless otherwise mentioned hereunder, the concrete shall be prepared, mixed and placed in position in accordance with the particular specifications given earlier. The Contractor shall maintain a record of the proportions of mix at the batching plant and produce the same for checking by the Engineer whenever required. Casting of girder shall be done in a single pour.

The contractor shall take care in placing reinforcement cage so that cables/strands are not disturbed and the minimum cover as recommended in the drawing is available. The girder shall be cast with specified camber and curvature.

**c. Forms for Precast Pre-Stressed Girders**

The pre-tensioned girders shall be cast at casting yard. The contractor shall clean, thoroughly, the steel forms of all dirt, mortar and other matter such as chips, blocks etc. prior to using them. The contractor shall check the accuracy of alignment and rectify the inconsistencies, if any, of the forms and steel casting bed. Contractor shall also take care of bulkheads including positioning of jacks who may become necessary to suit the design requirement of the precast girders or as instructed by the Engineer. Forms shall be specifically suited to external form vibrators.

Some of the precast pre-tensioned girders are curved. The moulds in the precast yard shall be adjustable to construct these curved beams as per the Construction drawings.

**d. Permissible tolerances**

The formwork for precast girder shall be so made that it produces a finished concrete true to shape, lines, levels, plumb and dimension shown on the drawings subject to the following tolerance unless otherwise specified in these documents or directed by Engineer.

**Length of Girder**

Per 3 m length	-	±3 mm
Maximum for entire length	-	±10 mm

**Cross-sectional Dimension**

Web	-	±3mm
Flange/Slab	-	± 3mm
Depth	-	± 3mm
Plumb	-	1 in 1000

Location of Strand -  $\pm 3$  mm

**e. Quality Control and Testing Materials**

The contractor shall carry out all tests of materials in order to guarantee the specified quality in accordance with the relevant clauses of this specification.

**f. Steam Curing of Precast girders**

**g. Marking of Precast Elements**

Precast Elements shall be marked immediately after removing the side forms with paint of approved quality. The elements shall be marked at minimum four places on outer faces of webs and at the ends with the following details:

- a) Girder Number.
- b) Date of casting the girder.

**h. Tests of Precast Pre-Tensioned Elements**

Precast units shall be load tested at service load after erection on site and up to failure at precast yard, as approved by the Engineer.

Prior to carrying out load tests, if required, the contractor shall submit arrangement of testing, loading etc. and shall carry out any modifications, if needed, on the existing testing arrangement to the satisfaction of the Engineer at no extra cost. The contractor shall submit a report containing test results and observations etc. to the department.

**i. Handling, Stacking, Transportation and Placing of Precast Element**

All aspects of casting, pre-tensioning, handling, transportation and erection shall be proposed by contractor in detailed method of statements along with calculations and submitted for approval of the Engineer. Detailed fabrication drawings of each element to be submitted by contractor for approval of the Engineer.

All handling, lifting and erection equipment shall be load-tested prior to their use and also when ordered by the Engineer.

Handling of precast members shall be allowed only after the same have attained the specified strength.

The members shall be lifted only from the positions specified for this purpose. Precast members are to be lifted, stacked and/or handle such that self-weight is mobilized and supports are located as per their final bearing conditions.

Lifting inserts are to be proposed by the contractor for approval of the Engineer.

For precast pre-tensioned member's arrangements would be required for de bonding of strands for part length towards end of members. All exposed edges of precast elements should have chamfers of 10mm x 10mm. All necessary safety precautions will be taken to avoid any accident and damage during handling of the precast units. Special precautions shall be taken during and after erection for stability of the precast elements.

The contractor shall submit detailed plan showing stacking of precast elements at casting yard and at site and shall obtain approval of the Engineer.

The precast girders shall be stacked on timber or any other suitable supports provided over the firm ground/base. The girders shall be placed side by side on these supports. Care shall be taken to avoid any undue loading of girders during stacking.

The girders shall be transported in an upright position and points of support and the direction of reaction with respect to the girders shall approximately be the same during storage as when the girder is placed in final position. The transportation of precast units to position or to lifting position (to the deck) shall be done during night unless otherwise permitted by the Engineer.

The contractor shall obtain necessary permission from the concerned departments for transporting the precast girders. The contractor should study the problems likely to arise in the transportation of long girders on heavy traffic road. The road movements shall be possible only from 12.00 midnight to 6.00 AM. Mode of transportation, proposed by Contractor, shall be approved by the Engineer before commencing the transportation operation. Proper precautions should be taken during handling of precast units during transportation and all traffic safety measures taken.

The contractor shall be required to execute all handling and re handling of girders including interim storages etc., till these are finally erected, within his quoted rate. Contractor can plan the activities in advance to reduce such handling if practicable. The contractor should plan for emergencies in case of failure of a trailer. Adequate standby arrangements will have to be made. Transport, handling and storage operations must:

- Ensure the security of all personnel by avoiding any risk of instability of the members or of the lifting or handling equipment,
- Avoid any unexpected stress and excessive deformation,
- Eliminate every risk of deterioration capable to alter the aspect or the durability of the structure.
- Avoid any thermal shock during storage.

When placing the precast units in position, care should be taken to place the right unit in the right position with minimum handling of units. Care should also be taken to prevent any damage to the precast units. Units damaged by improper storing or handling/re-handling shall be replaced by the contractor at his own expense. The methodology proposed by the Contractor for placing these units, shall be approved by the Engineer, before commencement of the work. The rate for the reinforcement in the girders shall also include cutting of temporary handles (rebar), if required. The contractor shall prepare and submit a form for each span indicating the location and girder number of each girder.

**j. Shop Drawings and Design Calculations for Construction Procedures**  
**General**

The Contractor shall submit according to a schedule, complete details and information concerning the method, materials, equipment and procedures he proposes to use. These shall be called "Method Statements". Method Statements

shall be submitted sufficiently in advance of the start of superstructure field construction operations, so as to allow the Engineer adequate review period, which shall not be less than 30 days. The submittals shall invariably include step-by-step casting, lifting, curing, stacking, transportation and erection procedure. The Contractor's Method Statements shall also include all calculations, drawings and information as may be relevant. The following points are specifically highlighted:

- Accommodating block-outs, openings and protrusions. Protruding re-bars may be needed (track starter rebar, for example). Anchorages and inserts for OHE poles, signalling equipment and cable routing supports shall also be included where needed in precast beams.
- Adjusting to changes in girder length, curve, inclination and camber as shown in Detailed Design Drawings.
- Adjusting the profile to take into account design camber values
- Stripping without damage to the concrete.
- The form design shall provide a tapered portion at both end for bearing of elastomeric bearing.
- Forms shall not be removed until the concrete has attained adequate strength. Care should be exercised in removing the forms to prevent spalling and chipping of the concrete.
- All side, bottom and end forms for precast beams shall be constructed of steel.
- Forms shall be of sufficient thickness, with an adequate external bracing and stiffeners, and shall be sufficiently anchored to withstand the forces due to placement and vibration of concrete. No tie bolt is permitted for casting of precast beam. Joints in the forms shall be designed and maintained for mortar tightness. The grade and alignment of forms shall be checked each time they are set and shall be maintained during the casting of concrete.

**k. Design Calculations for Construction Procedures**

Design assumptions and calculations shall be submitted for temporary pre-stressing, false work, erection devices, formwork or other temporary construction which may be required to complete the work.

—Assumptions and Calculations shall also be submitted to substantiate the system and method of permanent and temporary pre-stressing proposed by the Contractor.

—In the sections that follow, specific recommendations for precast full span construction for superstructure are given apart from certain special aspects of construction.

—Shop Drawings for Precast Full Span Construction

—The Contractor shall submit detailed shop drawings for approval. The shop drawings shall be based on Final Design Drawings issued by MAHA METRO to the Contractor and shall include:

- Fully and accurately dimensioned views showing the geometry of precast units including all projections, recesses, notches, openings, block-outs, blister if any and where acceptable, as well as other pertinent details.
- Details of any special reinforcing required for handling of precast units or for other purposes. Also all bar bending schedules shall be presented based on reinforcement schedules given in Final Drawings issued by Maha Metro.
- Details and locations of all other items to be embedded in the precast units such as inserts, lifting devices shall be shown.
- Pre-stressing system details shall include sizes and properties of strands, assemblies and stressing procedure, de bonding tubes and locations of additional reinforcement necessary to resist pre-stressing stresses.
- Graphs, charts or tables showing the theoretical location of each precast units, as erected or placed shall be furnished to the Engineer for his use in checking the erection of the superstructure. Detailed procedures for making geometry correction shall be designed.
- Details of sealing of de bonding tubes and protection of strands.
- Method of installing bearings and expansion joints shall be given including approved manufacturer's recommendations.
- Forms for Precast Full Span Construction
- Forms for precast unit's construction shall be metal form work only. Shop drawings shall be submitted for all formwork. The precast units during storing /curing shall always be supported as shown in tender drawings or as approved by Engineer only.
- In addition to the requirements of the Standard Specifications, the forms used for precasting shall be capable of:
  - Producing the precast units within the tolerances permitted in this section.
- Accommodating block-outs, openings and protrusions. Protruding re-bars will be needed at least for second-pour plinths. Anchorages and inserts for OHE poles, signaling equipment and cable routing supports shall also be included where needed in precast units.
- Adjusting to changes in precast unit's geometry as shown in Final Design Drawings issued by MAHA METRO, or for correcting previous minor casting errors to prevent accumulation.
- Adjusting the profile to take into account design camber values
- Stripping without damage to the concrete.
- Joints in external formwork shall be avoided as far as possible. Where sections of forms are for some reason to be joined on the exterior face of the precast units, an offset in excess of

0.5mm for flat surfaces and 1 mm for comers and bends will not be permitted.

—Forms shall not be removed until the concrete has attained adequate strength. Care should be exercised in removing the forms to prevent spading and chipping of the concrete.

—All side, bottom, inside and header forms for precast unit's construction shall be constructed of steel.

—Forms shall be of sufficient thickness, with an adequate external bracing and stiffeners, and shall be sufficiently anchored to withstand the forces due to placement and vibration of concrete. Internal bracing and holding devices in forms shall be limited to stay bolts in webs, which can be removed from the concrete surface to permit patching following form removal. Joints in the forms shall be designed and maintained for mortar tightness. The grade and alignment of forms shall be checked each time they are set and shall be maintained during the casting of concrete.

—Metal forms shall be reasonably free from rust, grease or other foreign materials. All forms shall be cleaned thoroughly prior to each casting operation. End headers shall be maintained to smooth casting surface.

—All formed surfaces for casting members shall be constructed and maintained to provide precast units' tolerances.

- The faces of all forms, other than end headers, shall be properly cleaned and treated with form oil or other bond breaking coating prior to placing concrete. The oil or other materials used shall be of a consistency and composition to facilitate form removal. Materials, which stain or react with concrete, shall not be used. Care shall be exercised to facilitate formwork and precast unit's removals without damage to the concrete.

#### **6.15 Precast Pretension/Post Tensioned I Girders:**

- a. Additional specification for I-girder structure Concrete I-girder deck structure / station beams shall be made of precast pre-tensioned / post-tensioned I-girder, and cast in-situ slab, If applicable.

Slabs on top of concrete I-girder, shall be reinforced concrete,

#### **6.16 Measurements for Payment (Not applicable for Schedule B):**

Prestressed Concrete shall be measured in -cubic metres based on theoretical cross- sectional area and length. The volume occupied by mild steel reinforcement / HYSD bars; high tensile steel, sheathing and anchorages shall not be deducted. Measurement for transportation of precast member/segment shall be measured in metric tonnes based on standard density of concrete equivalent to 2.5 t/cum including the weight of rebars, sheathing ducts, embedments etc.

Supplying, fixing and tensioning steel HT wires/strands/cables (measured between anchorages) shall be measured in metric tonnes on theoretical basis based on the standard weight per metre length. Each size shall be measured separately. No allowance shall be made for extra lengths in anchorages or elsewhere.



HDPE sheathing, grouting operations, couplers for sheathing, anchorages, epoxy protection of anchorages, stressing using Multi strand stressing jacks, samples for testing including testing, sealing of anchorage recess with concrete (same grade as structure) and all related operations to complete the work shall all be deemed to be included in the main item of HT strand and shall not be paid for separately. The rate shall also include payments, if any to be made to the supplier of the prestressing system who has to monitor, ensure and certify the correctness of all the arrangements/operations.

**S.07: STRUCTURAL STEEL WORKS****7.1 STRUCTURAL STEELWORK SPECIFICATIONS- GENERAL****7.1.1 Scope of Specification**

This specification covers the scope of work of structural steel works, submittals by the contractor, applicable codes of practice for structural steel work and the specifications for the materials to be used, including steel, bolts & nuts, washers etc. and the storage thereof. These specifications shall be read in conjunction with the CPWD specifications 2019, MORTH specifications and other relevant reference specifications described in the S.01 of Section-VII-F of these specifications.

**7.1.2 Scope of Work**

The scope of work for the contractor in respect of structural steel work shall cover, but shall not be limited to the following:

- A. Submittal of detailed design drawings, preparation of complete detailed fabrication drawings and erection marking drawing based on the design drawings, required for all the permanent and temporary structures
- B. Submittal of revised design with calculations and detailed fabrication drawings, in case any substitution of the designed sections is required.
- C. Submittal of design calculations for joints and connections to be developed by the contractor along with detailed fabrication drawings.
- D. Supply of all raw steel materials for fabrication, taking into account wastage margin, including storage and upkeep of the materials.
- E. Furnishing of all materials, labour, tools and plant and all consumables required for fabrication and supply of all necessary bolts, nuts, washers, tie rods and welding electrodes for field connections, with necessary wastage margins.
- F. Fabrication of the steel works in accordance with the approved fabrication drawings including all shop assembling, matching and marking. Design, manufacture / fabrication and provision of all jigs, fixings, manipulators etc. required for the fabrication.
- G. Provision of shop painting and requisite site painting to all fabricated steelwork, as per requirements of the related specification of the painting.
- H. Suitability marking, bundling and packing for transport of all fabricated materials. Preparing and furnishing detailed bill of materials, drawing office dispatch lists, bolts lists and any other lists of bought out items required in connection with the fabrication and erection of the structural steelwork.
- I. Loading, Transportation and unloading of all fabricated structural steel materials from site storage yard to erection site, handling, assembling, bolting, welding and satisfactory installation of all fabricated structural steel materials in proper location, according to approved erection drawings and/or as directed by the Engineer.

- J. The contractor shall submit, for examination by the Engineer, detailed particulars of his proposed methods of erection of the superstructure steelwork, together with complete calculations relating to strength and deflection. If the erection scheme necessitates the attachment of strength steelwork (temporary work) to the permanent steel work, the contractor shall submit, for approval of the Engineer, the methods he proposes for making good the permanent steelwork after removing the temporary work. The contractor shall also submit the design and fabrication drawings of all temporary supports, staging, braces etc. required for safe erection, for approval of the Engineer.
- K. The contractor shall provide all construction and transport equipment, tools, tackles, consumables, materials, labour and supervision required for the erection of the structural steelwork.
- L. Receiving, unloading, checking and moving to storage yard, storage, guarding and upkeep of fabricated steelwork and other consumable materials and fasteners at site.
- M. Transportation of all fabricated structural steel materials from site storage yard, handling, assembling, bolting, welding and satisfactory installation of all fabricated structural steel materials in proper location, according to approved erection drawings and/or as directed by the Engineer.
- N. Setting out, aligning, ensuring verticality (proper plumb), levelling, bolting, welding and securely fixing the fabricated steel structures in accordance with the erection scheme, or as directed by the Engineer.
- O. Provision of requisite site painting to all fabricated steelwork, as per requirements of related specifications of the painting.
- P. Providing protective treatment to the erected steel structures, as per Specification.
- Q. All major modifications of the fabricated steel structures, as directed by the Engineer, including but not limited to the following:
  - i) Removal of bends, kinks, twists etc. for parts damaged during transport and handling.
  - ii) Cutting, chipping, filling, grinding etc. if required or preparation and finishing of site connections.
  - iii) Reaming of holes for use of higher size bolt if required.
  - iv) Re-fabrication of parts damaged beyond repair during transport and handling or re-fabrication of parts which are incorrectly fabricated.
  - v) Fabrication of parts omitted during fabrication by error, or subsequently found necessary
  - vi) Drilling of holes which are either not drilled at all or are drilled in incorrect location during fabrication.
  - vii) Carry out tests in accordance with the related specification.
- R. Preparing and furnishing detailed bill of materials of fabricated parts received from MAHA METRO or its authorized fabricator.

- S. The Contractor shall observe all safety requirements for erection of structural steelwork as covered in IS: 7205.

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#### **7.1.3 Submittals**

- A. On commencement of the Project, the Contractor shall submit the following:  
Prior to the technical submittals, the contractor shall submit the proposed overall schedule for documentation such as calculations, shop/ working drawings, plan/ procedures and records. Submission of samples, process of fabrication / delivery/ erection for the approval of the Engineer.

Complete fabrication drawings, material lists, cutting lists, bolt lists, welding schedules and QC schedules, based on the design drawings furnished to him and in accordance with the approved schedule. It is highlighted that structural steel members dimensions indicated in tender drawings are tentative only, and may be modified during final design stage.

Results of any tests, as and when conducted and as required by the Engineer.

Manufacturer's test reports in respect of steel materials, bolts, nuts and electrodes, as may be applicable.

A detailed list of all constructional plant & equipment, such as cranes, derricks, winches, welding sets, erection tools etc. their make, model, present condition and location, readily available with the contractor and the ones he will employ on the job to maintain the progress of work in accordance with the contract.

The total number of experienced personnel of each category, like fitters, welders, riggers etc., which he intends to deploy on the project.

- B. The contractor shall submit a detailed erection programme for completion of the work in accordance with contract. This will show, in a proforma approved by the Engineer, the target programme, with details of erection proposed to be carried out in each week, details of major equipment required and an assessment of required strength of various categories of workers.
- C. The contractor shall submit complete design calculations for any alternative sections proposed by him, for approval of the Engineer. Use of any alternative section shall be subject to approval of the Engineer. However, no escalation in unit rates of work shall be allowed for such cases.

#### **7.1.4 Furnishing of Information**

- A. Design drawings shall be furnished by the contractor and all such drawings shall form part of these specifications.
- B. The Engineer reserves the right to make changes in the design drawings even after release for preparation of shop drawings to reflect addition, omission & modifications in data/details and requirements. Contractor shall consider such

changes as part of these specifications and the contract, and no extra claims shall be entertained on this account.

- C. Design drawings, approved by the Engineer, will show as appropriate the salient dimensions, design loads, sizes of members, location of openings at various levels and other necessary information required for the preparation of fabrication drawings, designs and erection details.
- D. It shall be clearly understood that the drawings of the Engineer are design drawings. The typical details of connections, cuts, notches, bend, etc. where shown in the design drawings are only for general guidance of the contractor. The contractor shall design and develop all such details based on the design forces and functional requirements.
- E. In case of variations in design drawings and specifications, the decision of the Engineer shall be final. Should the contractor, find any discrepancy in the information furnished by the Engineer, same shall be immediately brought to the notice of Engineer for resolution. The contractor shall obtain clarifications on discrepancies from Engineer before proceeding with the work.
- F. No detailed shop drawings will be accepted for examination by the Engineer unless the same, have first been completely checked by the contractor's qualified structural engineer (independent agency to be appointed by contractor) and are accompanied by an erection plan showing the location of all pieces detailed. The contractor shall check and ensure that detailing of connections is carefully planned to obtain ease in erection of structures, including field-welded connections and/or bolting.
- G. No fabrication work shall be started by the contractor without having obtained approval of Engineer on the relevant drawings. Approval by the Engineer of any of the drawings shall not relieve the contractor of his responsibility to provide correct design of connections, workmanship, fit of parts, details, materials and errors or omissions of all work shown thereon. The approval of Engineer shall constitute approval of the size of members, dimensions and general arrangement, but shall not constitute approval of the connections between members and other details.
- H. Drawings, for approval, shall be submitted by the contractor in an orderly manner commensurate with erection sequence and approved construction programme.
- I. The contractor shall furnish ten prints of all approved final drawings for field use and record purpose.
- J. The drawings prepared by the Contractor, and all subsequent revisions thereof shall be at the cost of the Contractor, and no separate payments shall be made for the same. Revisions shall incorporate all modifications, field changes, substitutions etc. effected. The rates/prices quoted for fabrication work shall be deemed to include the cost of such drawing work.
- K. The Contractor shall give due consideration to the need of trial assemblage at shop, weight and size limitation of elements for transportation from shop to construction site, temperature variation of 25 degree centigrade between the fabrication shop and site, site measurements or the as-built dimensions and avoidance of site welding except for fixtures. All the drawings shall be prepared in

metric units. The drawings should preferably be of A-1 standard size, and the details shown therein shall be clear /and legible. These drawings shall include but shall not be limited to the following:

- i) Assembly drawings, giving exact sizes of the sections to be used and identification marks of the various sections.
- ii) Dimensional drawings of base plans (plates), anchorages details in foundation, foundation bolts location etc.
- iii) Complete bills of materials and detailed drawings of all sections including their billing weights.
- iv) Shop details of temporary structures together with detailed calculations.
- v) Detailed shop drawings for proper co-ordination with the concrete components to which the steel members shall be connected, as required.
- vi) Any other drawings or calculations that may be required for proper completion of the works and clarification of the works or substituted parts thereof.
- vii) All 'as-built' drawings.

#### 7.1.5 Applicable Codes of Practice

The following specifications, standards and codes are included as part of this Specification. All standards, specifications, codes of practice current on the date of signing of agreement and referred to herein shall be applicable

1. IS: 800 (2007)	Code of Practice for General Construction in Steel.
2. IS: 808 (1989)	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections.
3. IS: 814 (1991)	Covered Electrodes for Manual Metal Arc Welding of Carbon & Carbon -Manganese Steel
4. IS: 816 (1969)	Code of Practice for Use of Metal Arc Welding for General Construction in Mild Steel.
5. IS: 817(1969)	Code of Practice for Training and Testing of Metal Arc Welders.
6. IS: 919 (1993)	ISO System of Limits & Fits (Part 1 & Part 2)
7. IS: 1148 (1982)	Hot Rolled Rivet Bars (upto 40mm) for Structural Purposes.
8. IS: 1182 (1983)	Recommended Practice for Radio Graphic Examination of Fusion Welded Butt Joints in Steel Plates.
9. IS: 1363 (1992)	Hexagon Head Bolts, Screws and Nuts of Product grade C.
10. IS:1364 (1992) (Part 1 to 5)	Hexagon Head Bolts, Screws and Nuts of Product Grades A & B
11.IS:1367(1991)	Technical Supply Conditions for Threaded Steel Fasteners.
12.IS:1821 (1987)	Dimensions for Clearance Holes for Bolts and Screws.
13.IS: 4206 (1987)	Dimensions for Nominal Lengths and Thread Lengths for Bolts, Screws and Studs.
14.IS:1852 (1985)	Rolling & Cutting Tolerances for Hot-Rolled Steel Product.
15.IS:1977 (1975)	Structural Steel (Ordinary Quality).
16.IS:2016(1967)	Plain Washers.
17. IS: 2062 (1992)	Steel for General Structural Purposes
18. IS: 2595 (1978)	Code of Practice for Radio Graphic Testing.
19. IS: 3600 (1985)	Methods of Testing Fusion Welding Joints.

20. IS: 3613 (1974)	Acceptance Tests for Wire Flux Combinations for Submerged Arc
	Welding.
21. IS: 3658 (1981)	Code of Practice for Liquid Penetrant Flow, Detection.
22. IS: 3757 (1985)	High Strength Structural Bolts
23. IS: 4000 (1992)	High Strength Bolts In Steel Structures-Code of Practice
24. IS: 4353 (1967)	Recommendations for Submerged Arc Welding of Mild Steel and
	Low Alloy Steel.
25. IS: 4943 (1968)	Assessment of Butt and Fillet Fusion Welds in Steel Sheet, Plate and Pipe
26. IS: 5334 (1981)	Code of Practice for Magnetic Particle Flow Detection of Welds
27. IS: 5369 (1975)	General Requirements for Plain Washers and Lock Washers.
28. IS: 5372 (1975)	Taper Washers for Channels
29. IS: 5374 (1975)	Taper Washers for I Beams.
30. IS: 6623 (1985)	Specification for High Strength Structural nuts
31. IS: 6649 (1985)	Specifications for hardening and tempering washers for high strength structural nuts
32. IS: 6755 (1980)	Double Coil Helical Spring Washers.
33. IS: 7215 (1974)	Tolerances for Fabrication of Steel Structure.
34. IS: 7318 (1974) (Part I)	Approval Tests for Welders When Welding Procedure Approval is not required - fusion Welding of Steel.
35. IS: 8500 (1991)	Structural steel - Micro alloyed (Medium and High Strength Qualities)
36. IS: 8910 (1978)	General requirements of Supply of Weldable Structural Steel.
37. IS: 9595 (1980)	Recommendations for Metal Arc Welding of Carbon & Carbon-Manganese Steels.
38. IS 10178 (1995)	CO2 gas shielded Metal - Arc welding of Structural steels - Recommendations

**7.1.6 Products****7.1.6.1 Materials**

- A. All materials to be supplied by the Contractor shall conform to relevant Indian, Standards or equivalent, as approved by the Engineer.
- B. Steel materials required for the work shall be free from imperfections, mill scales, slag intrusions, laminations, pittings, rusts etc. that may impair strength, durability and appearance. All materials shall be of tested quality only. If desired by the Engineer, test certificates in respect of each consignment shall be submitted in triplicate. Whenever the materials are permitted for procurement from identified stocks, a random sample shall be tested at an approved laboratory, as directed by the Engineer.

**7.1.6.2 Structural Steel**

All structural steel shall be of tested quality and shall conform to one of the following standards:

IS: 226 Structural steel (Standard Quality)

IS: 2062 Grade -B Structural steel (Fusion welding quality)

IS: 961 High Tensile Structural Steel (Ordinary)

IS: 1161 Steel Tubes for Structural purposes

IS:8500 - Grade Fe 540 HT(High Tensile)

The Contractor shall supply to the Engineer, copies of the manufacturer's test certificate that the steel brought to the site for incorporation in the works is of a quality fully complying with the specifications. If required by the Engineer, the Contractor shall arrange for testing of the steel samples as per IS: 1608 - 1599.

#### **7.1.6.3 Bolts and Nuts**

For splicing of any structural member wherever required HSFG bolts and nuts of property class-8.8 conforming to IS:3757 and IS:6623 (1985) respectively shall be used. Unless specified otherwise, the bolts shall be hexagonal. All anchor bolts shall be of property class of 8.8 and nuts shall conform to IS: 1363 (1992), IS:1364 (1992) and IS:1367, as applicable, and unless specified otherwise, shall be hexagonal. All nuts shall conform to property class compatible with the property class of the bolts used.

#### **7.1.6.4 Washers**

For HSFG bolts, washers shall be conforming to IS:6649 (1985). Plain washers shall be conforming to IS:5369 (1975), unless otherwise specified. One washer shall be supplied with each bolt and in case of special types of bolts, more than one washer as needed for the purpose shall be supplied. An additional double coil helical spring washer, conforming to IS:6755 (1980), shall be provided for bolts carrying dynamic or fluctuating loads and those in direct tension. Tapered washers, conforming to IS:5372 (1975) and IS:5374 (1975), shall be used for channels and beams respectively wherever required.

#### **7.1.7 Storage of Materials**

##### **7.1.7.1 General**

All materials shall be so stored as to prevent deterioration and to ensure the preservation of their quality and fitness for the work. If required by the Engineer, the materials shall be stored under cover and suitably painted for the protection against weather. Any material, which has deteriorated or has been damaged shall be removed from site and replaced by new members as directed by the Engineer at no extra cost and time.

- A. The steel to be used in fabrication shall be stored in a separate stack clear off the ground section wise and lengthwise.
- B. The storage area shall be kept clean and properly drained. Structural steel shall be so stored and handled in such a manner that members are not subjected to excessive stresses and damage. Girders and beams shall be placed in upright position. Long members shall be supported on closely spaced skids/runners to avoid unacceptable deflection.

##### **7.1.7.2 Yard**

- A. The Contractor shall be required to establish a suitable yard, in an approved location at site for storing the fabricated steel structures and other materials which will be delivered to site. The yard shall have proper facilities such as drainage and lighting including access for cranes, trailers and other heavy equipment.



- B. The Contractor shall have been deemed to have visited the site, prior to submission of his tender, to acquaint himself with the availability of land and the development necessary by way of filling, drainage, access roads, fences, sheds etc., all of which shall be carried out by the Contractor at his own cost and as directed by the Engineer.

#### **7.1.7.3 Covered Store**

All field connection materials, paints etc. shall be stored on racks and platforms, off the ground, in a properly covered building by the contractor.

## **7.2 STRUCTURAL STEELWORK SPECIFICATION –WELDED STRUCTURE**

### **7.2.1 General**

#### **Scope of Specification**

This Specification covers the supply, fabrication and delivery to Site of welded structural Steelwork, including the supply of all consumables, electrodes and other materials required for fabrication and field connections of all structural steelwork covered under the scope of the Specification.

### **7.2.2 Products**

Ref. Specification 7.1.6 for Structural Steel

### **7.2.3 Execution**

#### **7.2.3.1 Workmanship**

##### **7.2.3.1.1 General**

All workmanship shall be in accordance with the best practices in modern structural shops. Greatest accuracy shall be maintained in the manufacture of every part of the work and similar parts shall be strictly interchangeable. The contractor shall not proceed with any welding until the Engineer has approved his welding plan, which shall include.

- All information on welding procedures, equipment, additives and preheating during welding operation.
- Details of non- destructive testing methods.
- Precautions with regard to welding shrinkage.
- Possible treatment of completed welds by grinding.
- Procedure and programme of welding sequence.
- Pre Heating the to be welded components as per relevant codes.

##### **7.2.3.1.2 Templates**

Templates used throughout the work shall be of steel. In cases where actual materials have been used as templates for drilling similar pieces, the Engineer shall decide whether such materials are fit to be used as parts of the finished structure.

##### **7.2.3.1.3 Straightening**

All materials shall be straight and free from twists, and if necessary, before being worked, shall be straightened and/or flattened by pressure, unless required to be of curvilinear form.

#### **7.2.3.1.4 Clearance**

The clearance between faying surfaces of bolted connections shall not be greater than 1mm for each end. If separation is between 1 to 3mm, the surface should be tapered to eliminate the separation. Over 3mm separation shall be filled with filler plates.

#### **7.2.3.1.5 Shearing, Cutting and Planning**

Cutting shall be done automatically. Cutting by shearing machine may be used for plates not exceeding 10 mm in thickness provided that the plate edges be fully enclosed in a weld. Oxygen cutting may be used provided a smooth and regular surface free from cracks and notches is secured.

1. Chipping of angle flanges and edges of plates, wherever necessary, shall be done without damaging the parent metal. Chipped edges shall be ground to a neat finish and sharp corners and hammered rough faces shall be rounded off.
2. The edges and ends of all cut/sheared plate members, flange plates, web plates of plate girders, and all cover plates, and the ends of all angles, tees, channels and other sections forming the flanges of plate girders, shall be planed/ground. Edge preparation for welding may be done by machine controlled flame cutting, with edges free from burrs should be clean and straight.
3. The butting surfaces at all joints of girders shall be planed so as to butt in close contact throughout the finished joint.
4. All flame cut surfaces shall be ground to remove the burned/ hardened portion of the material for flame cut surfaces.

#### **7.2.3.1.6 Assembly**

1. All parts assembled for welding shall be in as close contact as practicable over the whole surface.
2. The component parts shall be so assembled that they are neither twisted nor otherwise damaged. Specified cambers, if any, shall be provided.
3. All parts of bolted and welded members shall be held firmly in position by means of jigs or clamps while bolting or welding. No drifting of holes shall be permitted, except to draw the parts together and no drift used shall be larger than the nominal diameter of the bolt. Drifting done during assembling shall not distort the metal or enlarge the holes.
4. Trial assemblies shall be carried out at the fabrication stage to ensure accuracy of workmanship. These checks shall be witnessed by the Engineer-in-Charge and such trial assemblies shall be at the cost of the Contractor.

#### **7.2.3.2 Welding**

##### **7.2.3.2.1 General**

The welding and the welded work shall conform to welded bridge code, IS:816 (1969) and IS:9595 (1980), IS: 4353 (1967) unless otherwise specified. As much work as possible shall be welded in shops and the layout and sequence of operations shall be so arranged as to eliminate distortion and shrinkage stresses.

#### 7.2.3.2.2 Electrodes

All electrodes shall be kept under dry conditions. Any electrode damaged by moisture shall not be used unless it is guaranteed by the manufacturer that, when it is properly dried, there will be no detrimental effect. Any electrode, which has part of its flux coating broken away or is otherwise damaged, shall be rejected. Any electrode older than six (6) months from the date of manufacture shall not be used. Batch certificates for electrodes shall be submitted by the Contractor.

Manual Metal Arc Welding electrodes shall be adopted as per following details:

Serial No.	Classification	Brand Name	Manufacturer	Remarks
1	E-6013	Overcord Steelon Standard Excel-123 S Ferrospeed Plus	M/s Advani Oerlikon (P) Ltd. Modi Arc Electrodes Co. Weld Excel India Ltd. (Modi Group Co.) ESAB India Ltd.	For Structural Steel members having thickness up to 15mm
2	E-7018	Super Cito Modi-7018 Excel-18 S	Advani Oerlikon Modi Arc Electrodes.	For Structural Steel members having thickness more
		ESAB 36H	Weld Excel India Ltd. (Modi Group Co.) ESAB India Ltd	than 15mm

For MIG and SAW welding the suitable product/brand of above mentioned manufacturer shall be used.

Any other product of equal or superior quality or performance is acceptable.

#### 7.2.3.2.3 Preparation of Joints

1. The edges shall be prepared, with an automatically controlled flame cutting torch, correctly to the shape, size and dimensions of the groove, prescribed in the design and fabrication drawings. In case of U-groove joints, the edges shall be prepared with an automatic false cutting torch in two phases, following a bevel out with a gouging pass, or by machining.
2. The welding surfaces shall be smooth, uniform and free from fins, tears, notches or any other defects, which may adversely affect welding, and shall be free of loose scale, slag, rust, grease, paint, moisture or any other foreign material.

**7.2.3.2.4 Welding Procedure**

1. All welding procedures shall be submitted to the Engineer for approval, well before starting fabrication.
2. The welding procedures shall be arranged by the Contractor to suit the details of the joints, as indicated in the drawings and the position at which welding has to be carried out. Welding procedure shall cover the following:
  - a. Type and size of electrodes
  - b. Current and (for automatic welding) arc voltage
  - c. Length of run per electrode; or (for automatic welding) speed of travel
  - d. Number and arrangement of runs in multi run welds
  - e. Position of welding
  - f. Preparation and set-up of parts
  - g. Welding sequence
  - h. Pre or post heating
  - i. Any other relevant information.
3. The welding procedures shall be so arranged that distortion and shrinkage stresses are reduced to the minimum, and that the welds meet the requirement of quality specified.
4. Any weld found defective shall be removed, by using either chipping hammer or gouging torch, in such a manner that parent material is not injured in any way.

**7.2.3.2.5 Fusion Faces and Surrounding Surfaces**

1. Fusion faces and the surrounding surfaces within 50mm of the welds shall be free from all mill scale and free from oil, paint or any substance which might affect the quality of the welds or impede the quality/progress of welding. These shall be free from irregularities, which would interfere with the deposition of the specified size of weld or be the cause of defects.
2. All mill scale within 50mm of welds shall be removed prior to welding, either by pickling followed by thorough power wire brushing, or by other approved methods.
3. If preparation or cutting of the fusion faces is necessary, the same shall be carried out by shearing, chipping, gas cutting or flame gouging.
4. Where hand gas cutting or hand gouging is employed, the blowpipe or gouging blowpipe shall be properly guided.

**7.2.3.2.6 Assembly for Welding**

Parts to be welded shall be properly assembled and held firmly in position by means of jigs and clamps prior to and during welding.

**7.2.3.2.7 Welded Girders and Other Plate Construction**

Automatic submerged arc welding shall be employed for fabrication of welded girders and other plate construction, wherever specified. Metal Inert Gas (MIG) welding (CO<sub>2</sub>) may be done for short length where access to the location of the weld does not permit submerged arc welding subject to approval of Engineer.

**7.2.3.2.8 Accuracy of Fit-Up**

Parts to be fillet welded shall be brought into as close contact as practicable, and the gap due to faulty workmanship or incorrect fit-up shall not exceed 1.5mm. If

greater separation occurs at any position, the size of fillet weld shall be increased at such positions by the amount of the gap.

**7.2.3.2.9 Jigs and Manipulators**

Jigs and manipulators shall be used, where practicable, and shall be designed to facilitate welding and to ensure that all welds are easily accessible to the operators.

**7.2.3.2.10 Ends of Butt Welded Joints**

The ends of butt joints shall be welded so as to provide full throat thickness. This may be done by the use of extension pieces, cross-runs or other approved means.

**7.2.3.2.11 Weld Face and Reinforcement of Butt welds**

The weld face shall, at all places, be deposited projecting the surface of the parent metal. Where a flush surface is required, the surplus metal shall be dressed off.

**7.2.3.2.12 Testing of Butt Welds**

All butt welds shall be tested 100% for DPT & UT and 20% for MPT in addition 25% of the Butt-welded joints are to be radio graphically tested by the Contractor at his own cost. If such tests indicate the joints to be defective, the cost of rectification of defective welds shall also be borne by the Contractor.

**7.2.3.2.13 Minimum Leg Length & Throat Thickness in Fillet Welds**

The minimum leg length of a fillet weld as deposited shall be not less than the specified size. In no case shall a concave weld be deposited, unless specifically permitted. Where permitted, the leg length shall be increased above that specified length, so that the resultant throat thickness is as great as would have been obtained by the deposition of a flat-faced weld of the specified leg length.

All fillet welds shall be tested 100% for DPT & UT and 20% for MPT by the Contractor at his own cost. If such tests indicate the joints to be defective, the cost of rectification of defective welds shall also be borne by the Contractor.

**7.2.3.2.14 Dislodging**

After making each run of welding, all slag shall be thoroughly removed and the surface cleaned.

**7.2.3.2.15 Quality of Welds**

The weld metal, as deposited (including tack welds), shall be free from-cracks, slag inclusions, porosity, cavities and other deposition faults. The weld metal shall be properly fused with the parent metal without under cutting or overlapping at the toes of the weld. The surface of the weld shall have a uniform consistent contour and regular appearance.

If in case, rectification/repairs of welded components becomes necessary then the defective weld portion shall also be tested by PAUT testing.

**7.2.3.2.16 Weather Conditions**

Welding shall not be done under weather conditions, which might adversely affect the efficiency of welding.

**7.2.3.2.17 Qualification and Testing of Welders**

The Contractor shall satisfy the department that the welders are suitable for the work for which they will be employed, and shall produce evidence to the effect that welders, have satisfactorily completed appropriate tests, as described in IS:817 Part I (1992). The Engineer may, at his own discretion, order periodic tests of the welders and/or of the welds produced by them. Such tests shall be at the expense of the Contractor.

**7.2.3.2.18 Supervision**

The Contractor shall employ competent welding supervisors to ensure that the standard of workmanship and the quality of the materials comply with the requirements laid down in this Specification.

**7.2.3.2.19 Machining of Butts and Bases**

Splices and butt joints of compression members, depending on contact for stress transmission, shall be accurately machined over the whole section. In column bases, the ends of shafts together with the attached gussets, angles. Channels etc., after bolting and/or welding together as the case may be, shall be accurately machined so that the parts connected butt over the entire surface of contact. Care shall be taken that connecting angles or channels are fixed with such accuracy that they are not reduced in thickness by machining by more than 0.8mm.

**7.2.3.2.20 Requirement of Welded Joints**

Apart from the requirements of welding specified under the above sub clauses, sections above, the Contractor shall ensure the following requirements in the welded joints.

- i) Strength-quality with parent metal.
- ii) Absence of defects.
- iii) Corrosion resistance of the weld shall not be less than that of parent metal in an aggressive environment

**7.2.3.3 Shop Assembly**

1. The steelwork shall be temporarily shop assembled, as necessary, so that the accuracy of fit may be checked before dispatch. The parts shall be shop assembled with a sufficient number of parallel drifts to bring and keep the parts in place.
2. Since parts drilled or punched, with templates having steel bushes shall be similar and, as such, interchangeable, such steelwork may be shop erected in part only, as agreed by the Engineer.

**7.2.3.4 Erection Marking**

1. Each fabricated member, whether assembled prior to dispatch or not so assembled, shall bear an erection mark, which will help to identify the member and its position in respect of the whole structure, to facilitate re-erection at site.
2. These erection marks shall be suitably incorporated in the shop detail and erection drawings.

**7.3 STRUCTURAL STEELWORK SPECIFICATION : BOLTED STRUCTURE**

**7.3.1 General****7.3.1.1 Scope of Specifications**

These specifications cover the supply, fabrication and delivery to site of bolted structural steelwork, including the supply of all consumables and other materials required for fabrication and field connections of all structural steelwork covered under the scope of the specification.

**7.3.2 Products**

Ref. Specification 7.1.6 for Structural Steelwork -General

**7.3.3 Execution****7.3.3.1 Workmanship****7.3.3.1.1 General**

All workmanship shall be in accordance with the best practice in modern structural shops. Greatest accuracy shall be maintained in the manufacture of every part of the work and all similar parts shall be strictly interchangeable.

**7.3.3.1.2 Templates**

Templates used throughout the work shall be of steel, in cases where actual materials have been used as templates for drilling similar pieces, the Engineer shall decide whether such materials are fit to be used as parts of the finished structure.

**7.3.3.1.3 Straightening**

All materials shall be straight and free from twists, and if necessary, before being worked shall be straightened and/or flattened by pressure, unless required to be of curvilinear form.

**7.3.3.1.4 Clearance**

The clearance between faying surfaces of bolted connections shall not be greater than 1 mm at each end. If the separation is between 1 to 3 mm the surface should be tapered to eliminate the separation. Over 3mm separation shall be filled with filler plates.

**7.3.3.1.5 Shearing, Cutting and planning**

1. Cutting shall be done automatically. Cutting by shearing machine may be used for plates not exceeding 10mm in thickness provided that the plate edges be fully enclosed in a weld. Oxygen cutting may be used provided a smooth and regular surface free from cracks and notches is secured.
2. Chipping of angle flanges and edges of plates, wherever necessary, shall be done without damaging the parent metal. Chipped edges shall be ground to a neat finish and sharp and sharp corners and hammered rough faces shall be rounded off.
3. The edges and ends of all cut/sheared flange plates, web plates of plate girders, and all cover plates, and the ends of all angles, tees, channels and other sections forming the flanges of plate girders, shall be planed/ground.
4. The butting surfaces at all joints of girders shall be planed so as to butt in close contact throughout the finished joint.
5. The ends of all built up girders and of all columns shall be faced in an end- milling machine after the members have been completely

assembled. Bearing edges for girder bearing stiffeners and column bases shall be machined.

6. Unless clean, square and true to sharp, all flame-cut edges shall be planed. Cold sawn ends, if reasonably clean and flame-cut ends of sections not inferior to sawn ends in appearance need not be planed, except for butting ends.

#### **7.3.3.1.6 Drilling**

1. Holes for bolts shall be drilled to conform to Clause 10 of IS:7215-1974. Punching of holes shall not be permitted. All holes, except as stated hereunder, shall be drilled to the required size, 3mm less in diameter and reamed thereafter to the required size. All matching holes for bolts shall register with each other so that a gauge of 0.8mm less in diameter than the hole can pass freely through the members assembled for bolting, in the direction at tight angle to such members.
2. All drilling shall be free of burrs.
3. No holes shall be made by gas cutting process.

#### **7.3.3.1.7 Assembly**

1. All parts assembled for bolting shall be in close contact over the whole surface
2. The component parts shall be so assembled that they are neither twisted nor otherwise damaged. Specified cambers, if any, shall be provided.
3. All parts of bolted and welded members shall be held firmly in position by means of jigs or clamps while bolting or welding. No drifting of holes shall be permitted, except to draw the parts together and no drift used shall be larger than the nominal diameter of the bolt.
4. Drifting done during assembling shall not distort the metal or enlarge the holes.
5. Trial assemblies shall be carried out at the fabrication stage to ensure accuracy of workmanship, and these checks shall be witnessed by the Engineer. Such trial assemblies shall be at the cost of the contractor.

#### **7.3.3.1.8 Field Bolts**

1. Requirements stipulated under bolting shall apply for field bolts. Field bolts nuts and washers shall be furnished by the Contractor in excess of the nominal numbers required. He shall supply the full number of bolts, nuts and washers and other necessary fittings required for completing the work, together with the additional bolts, nuts and washers totalling to 10% of the requirement subject to minimum of 10 Nos. Only HSFG bolts of class 8.8 shall be used.
2. At the time of assembly, the surfaces in contact shall be free of paint or any other applied finish, oil, dirt, loose rust, loose scale, burrs and other defects which would prevent solid seating of the parts or would interfere with the development of friction between them.
3. If any other surface condition, including a machined surface, is specified, it shall be the responsibility of the Contractor to work within the slip factor specified for the particular case.
4. Each bolt and nut shall be assembled with washers of appropriate shape, quality and number in cases where plane parallel surfaces are involved. Such washers shall be placed under the bolt head or the nut, whichever



is to be rotated during the tightening operation. The rotated nut or bolt head shall be tightened against a surface normal to the bolt axis, and the appropriate tapered washer shall be, used when the surfaces are not parallel. The angle between the bolt axis and the surface under the non-rotating component (i.e. the bolt head or the nut) shall be  $90 + 3$  degree. For angles outside these limits, a tapered washer shall be placed under the non-rotating component. Tapered washers shall be correctly positioned.

5. No gasket or other flexible material shall be placed between the holes. The holes in parts to be joined shall be sufficiently well aligned to permit bolts to be freely placed in position. Driving of bolts is not permitted. The nuts shall be placed so that the identification marks are clearly visible after tightening.  
Nut and bolts shall always be tightened in a staggered pattern and where there are more than four bolts in any one joint, they shall be tightened from the centre of the joint outwards.
6. If, after final tightening, a nut or bolt is slackened off for any reason, the bolt, nut and washer or washers shall be discarded and not used again.

7.

#### **7.3.3.2 Shop Assembly**

1. The steelwork shall be temporarily shop assembled, as necessary, so that the accuracy of fit may be checked before dispatch. The parts shall be shop assembled with a sufficient number of parallel drifts to bring and keep the parts in place.

#### **7.3.3.3 Erection Marking**

1. Each fabricated member, whether assembled prior to dispatch or not so assembled, shall bear an erection mark, which will help to identify the member and its position in respect of the whole structure, to facilitate re-erection at site.
2. This erection mark shall be suitably incorporated in the shop detail and erection drawings.

### **7.4 STRUCTURAL STEEL SPECIFICATIONS PAINTING WORKS**

#### **7.4.1 General**

##### **7.4.1.1 Scope of Specification**

This Specification covers the scope of painting, methods for the surface preparation, application of paints and precautions to be taken for the painting of structural steel work. It covers the supply and delivery of all necessary materials, labour, scaffolding tools, equipment and everything that is necessary for the job completion on schedule.

##### **7.4.1.2 Applicable Codes**

The following Specifications, Standards and Codes are included as part of this Specification. All standards and codes of practice referred to herein shall be the current editions during the currency of project including all applicable official amendments and revisions. In case of discrepancy between this Specification and those referred to herein, this specification shall govern. In case of discrepancy between Contract drawings and this specification, the Contract drawings shall govern.

- a) IS: 102 (1962) : Ready Mixed Paint, Brushing, Red lead, Non Setting, Priming.

- |    |                 |   |   |
|----|-----------------|---|---|
| b) | IS: 159 (1981)  | : | Ready Mixed Paint, Brushing, Acid Resisting for Protection against Acid Fumes, Colour as Required.    |
| c) | IS: 341 (1973)  | : | Black Japan, Types A, B & C.  |
| d) | IS: 384 ( 1979) | : | Brushes, Paints and Varnishes, Flat.  |
| e) | IS: 487 (1985)  | : | Brush, Paint and Varnish i) Oval Ferrule Bound ii) Round Ferrule Bound.                               |
| f) | IS: 958 (1975   | : | Temporary Corrosion Preventive Grease, Soft Film, Cold Application.                                   |
| g) | IS: 1153(1975)  | : | Temporary Corrosion Preventive, Fluid, Hard Film, Solvent Deposited.                                  |
| h) | IS: 1477(1971)  | : | Code of Practice for Painting of Ferrous Metals in Building. Part I - Pre-treatment Part II -Painting |
| i) | IS: 1674(1960)  | : | Temporary Corrosion Preventive Fluid, Soft Film, Solvent Deposited.                                   |
| j) | IS: 2074( 1992) | : | Ready Mixed Paints, Red Oxide -Zinc Chrome, Priming.  |

#### **7.4.2 Products**

##### **7.4.2.1 Materials**

###### **7.4.2.1.1 Paint**

1. All paint delivered to the fabrication shop/Site shall be ready mixed, in original sealed containers, as packed by the paint manufacturers, and no thinners shall be permitted.
2. Paint shall be stirred frequently to keep the pigment in suspension

###### **7.4.2.1.2 Storage of Paints**

1. All paints shall be stored strictly in accordance with the requirements laid down by the paint manufacturers. The storage area shall be well ventilated and protected from sparks, flame, direct exposure to sun or excessive heat, preferably located in an isolated room or in a separate building.
2. All paint containers shall be clearly labelled to show paint identification, date of manufacture, batch number, order number and special instructions in legible form. The containers shall be opened only at the time of use. Paints which have liveried, gelled or otherwise deteriorated during storage shall not be used. Paints for which the shelf life specified by the supplier has expired shall not be used without inspection and approval by the Engineer.

#### **7.4.3 Execution**

##### **7.4.3.1 Paint System**

1. Sand blasting where specified shall be carried out in accordance with IS:1477.
2. Painting work shall be carried out as follows:

##### **Painting Specifications**

DESCRIPTION	GENERAL SURFACE	
FABRICATION SHOP	EXTERNAL SURFACES	INTERNAL SURFACES
Surface Treatment	Abrasive blast cleaning to minimum SA-2.5 SIS-055900 near - white blast cleaning	Abrasive blast cleaning to minimum SA-2.5 SIS-055900 near - white blast cleaning
1 <sup>st</sup> Under - Coat	Inorganic zinc silicate primer (self-curing solvent type) DFT – 75 $\mu$ m shall be Berger Zinc Anode 11 or approved equivalent. The primer should be applied by spray only.	Epoxy Zinc phosphate primer polyamide cured DFT-35 $\mu$ m
2 <sup>nd</sup> Under-Coat	Epoxy zinc phosphate primer polyamide cured DFT - 35 $\mu$ m shall be Berge Epilux 610 Primer or approved equivalent. The primer should be applied by spray or brush only.	Epoxy zinc phosphate primer polyamide cured DFT-35 $\mu$ m shall be Berger Epilux 610 Primer or approved equivalent. The primer should be applied by spray or brush only.
3 <sup>rd</sup> Under-Coat	Epoxy zinc phosphate primer polyamide cured DFT-35 $\mu$ m shall be Berge Epilux 610 Primer or approved equivalent. The primer should be applied by spray or brush only.	Polyamide cured coal tar epoxy coating DFT 100 $\mu$ m
4 <sup>th</sup> Under Coat	Epoxy high build micaceous iron oxide coating polyamide cured DFT-90 $\mu$ m shall be Berger Epilux 4 High Build MIO. The primer should be applied by spray or brush only.	Polyamide cured coal tar epoxy coating DFT 100 $\mu$ m
ERECTION SITE	EXTERNAL SURFACES	INTERNAL SURFACES
Intermediate Coat	Acrylic polyurethane finish aliphatic isocyanate cured DFT-30 $\mu$ m shall be Berger thane or approved equivalent applied by spray or brush in approved colour.	NA
Finishing Coat	Acrylic polyurethane finish aliphatic isocyanate cured DFT-30 $\mu$ m shall be Berger thane or approved equivalent applied by spray or brush in approved colour.	NA

INTERNAL SURFACE = Internal surfaces are those which will become inaccessible after fabrication.

EXTERNAL SURFACE = All other surfaces which are prone to humidity and moisture from the Atmosphere.

The following precautions must be taken:

- a. After abrasive blast cleaning, the first undercoat (primer coat) should be applied well before surface deterioration.
- b. Over coating intervals, application parameters shall conform to manufacturer's instruction manual.
- c. The DFT (Dry film thickness) shall be measured after completion of each coat.
- d.

#### **7.4.3.2 Surface Preparation**

##### **7.4.3.2.1 General**

All surfaces shall be cleaned of loose substances and foreign materials, e. g. dirt, rust, scale, oil, grease, welding flux etc. so that the prime coat adheres to the original metal surface. The work shall be carried out in accordance with IS: 1477 (1971) (Part I). Any oil, grease, dust or foreign matter deposited on the surface after preparation shall be removed and care shall be taken to ensure that the surface is not contaminated with acids, alkalis or other corrosive chemicals. The primer coat shall be applied immediately after the surface preparation is completed.

Before the application of any paint, the surfaces to be treated shall be thoroughly cleaned freed from all scale, loose paint, rust and other deleterious materials. Oil and grease shall be removed from the surface by washing with solvents or with a detergent solution before blast cleaning operation of metal polish with metal pellets. If any traces of oil or grease remain after blasting they shall be removed by solvent cleaning and the area will be re-blasted thereafter.

All welded areas/joints shall be given special attention for removal of weld flux slag, weld metal splatter, weld head oxides; weld flux fumes, silvers and other foreign objects before blasting. If deemed necessary by the Engineer, acid washing and subsequent washing with clean water shall be used.

Any rough seams will have to be ground and must be inspected and approved by the Engineer-in-Charge before application of the coatings.

All structural steel to be painted shall be cleaned blast cleaning in accordance with SA 2 1/2 Near- White Blast cleaning (equivalent Swedish Standard SIS 055900). For SA 2 1/2 the profile should be in the range of 40-70 microns and shall be measured with comparator. Mill scale, rust and foreign matter shall be removed to the extent that the only traces remaining are light stains in the form of spots or stripes. Finally the surface shall be cleaned with a vacuum cleaner or clean dry compressed air.

The blast cleaning shall produce a surface roughness complying with the one specified by the paint manufacturer for the primer concerned. If cleaned surfaces are rusted or are contaminated with foreign material before painting is accomplished they shall be re-cleaned by the Contractor at his expenses.

The surface shall be cleaned by impingement of abrasive materials, such as grit of cast iron, malleable iron, steel or synthetic material, at high velocity created by clean and dry compressed air blast. Prior to application of the blast, heavy deposits of oil

and grease shall be removed by solvent cleaning and excessive surface scale removed by hand tool or power tool cleaning.

The last finish paint shall be applied after structural steel erection and slab construction.

#### **7.4.3.3 Mixing and Thinning**

1. All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments, before use and during application, to maintain homogeneity. All pigmented paints shall be strained after mixing to remove skins and other undesirable matters.
2. Dry pigments, pastes, tinting pastes and colors shall be mixed and/or made into paint so that all dry powders get wetted by vehicles and lumps and particles are uniformly dispersed.
3. Additives that are received separate such as curing agents, catalysts, hardeners etc. shall be added to the paint as per the manufacturer's instructions. These shall be promptly used within the pot life specified by the manufacturers and unused paint h thereafter shall be discarded.
4. Thinners shall not be used unless essential for proper application of the paint. Where thinners are used, they shall be added during the mixing process and the type and quantity of thinner shall be in accordance with the instructions of paint manufacturer.

#### **7.4.3.4 Paint Application**

##### **7.4.3.4.1 General**

1. Paint shall be applied in accordance with the manufacturer recommendations, as supplemented by these Specifications. The work shall generally follow IS: 1477 (1971) (Part II). Prior approval of the Engineer shall be taken in respect of all primers and/or paints, before their use in the works.
2. Paint shall generally be applied by brushing except that spraying may be use for finish coats only when brushing may damage the prime coats. Roller coat or other method of paint application shall not be used unless specifically authorized.
4. Spraying paint shall not be adopted on red lead or zinc rich paints. Daubers may be used only when no other method is practicable tor proper application in difficult accessible areas.
5. Paint shall not be applied when the ambient temperature is 10°C and below. For paints which dry by chemical reaction the temperature requirements specified by the manufacturer shall be met with. Also, paint shall not be applied in rain, wind, fog or at relative humidity of 80% and above or when the surface temperature is below dew point, resulting in condensation of moisture. Any wet paint exposed to damaging weather conditions shall be inspected after drying and the damaged area repainted after removal of the paint.
6. Each coat of paint shall be continuous, free of pores and of even film thickness without thin spots. The film thickness shall not be so great as to detrimentally affect either, the appearance or the service life of the paint.
7. Each coat of paint shall be allowed to dry sufficiently before application of the next coat, to avoid damages such as lifting or loss of adhesion.

Undercoats having glossy surface shall be roughened by mild sand papering to improve adhesion of subsequent coats. Successive coats of same colour shall be tinted whenever practical, to produce contrasts and help in identifying the progress of the work.

#### **7.4.3.4.2 Brush Application**

1. Proper brushes shall be selected for a specific work piece. Round or oval brushes which conform to IS:487( 1985) are better suited for irregular surfaces, whereas flat brushes which conform to IS:384( 1979) are convenient for large flat areas. The width of flat brushes shall not generally exceed 1.25mm.
2. Paint shall be applied in short strokes depositing a uniform amount of paint in each stroke followed by brushing the paint into all surface irregularities, crevices and corners and finally smoothening or leveling the paint film with long and light strokes at about right angles to the first short strokes. All runs and sags shall be brushed out. The brush marks left in the applied paint shall be as few as practicable.

#### **7.4.3.4.3 Spray Application**

1. The spraying equipment shall be compatible with the paint material and provided with necessary gauges and controls. The equipment shall be cleaned of dirt, dried paint, foreign matter and solvent before use.
2. The paint shall be applied by holding the gun perpendicular to the surface at a suitable distance and moved in a pattern so as to ensure deposition of a uniform wet layer of paint. All runs and sags shall be brushed out immediately. Areas not accessible to spray shall be painted by brush or dauber.
3. Water trap acceptable to Engineer shall be furnished and installed on all equipment used in spray painting.

#### **7.4.3.5 Shop Painting**

1. The painting system specified in Table shall be followed.
2. Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted but require protection shall be given a rust inhibitive grease conforming to IS.958-1975 or solvent deposited compound conforming to IS: 1153 (1975) or IS. 1674 (1960) or treated as specified in the drawing.
3. Surface to be in contact with concrete shall not be painted.
4. The shop coats shall be continuous over all edges, including ends meant for jointing at site by bolting, except where the paint could be detrimental to bolting. In such cases, no paint shall be applied within 50mm, and the unprotected surface shall be given a coat of corrosion inhibitive compound.
5. The unpainted area shall be cleaned prior to welding. The welded joint shall be cleaned and de-slagged, and immediately after covered by the same paint as has been used for the remaining surface.

#### **7.4.3.6 Protection of Paintwork**

1. The Contractor shall provide measures as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains which result in other unsightly appearance on surfaces not designated to be painted shall be removed or obliterated by the contractor at his cost.

2. All painted surfaces that in the opinion of the Engineer are damaged in anyway, shall be repaired by the contractor at his cost with materials and to a condition equal to that of the requirements specified in these specifications.
3. Upon painted surfaces that in the opinion of any other work that would cause dust, grease or foreign materials to be deposited upon the painted surfaces, the painted surfaces shall be thoroughly cleaned. At the time of opening the flyovers to public traffic, the painting shall be completed and the surfaces shall be undamaged and clean.
4. The areas for high-strength bolts shall be protected by masking tape against undercoat application at the fabrication shop. Immediately prior to erection any rust in the paint area shall be removed by power wire brushing to a standard equivalent to SA3.

#### **7.4.3.7 Site Painting**

1. After the erection of structures at the site, the contractor shall provide the necessary treatment as specified in Table "PAINTING SPECIFICATIONS".
2. Surface which has not been shop coated, but require surface treatment shall be given necessary surface preparation and coats at site as specified in Table.

### **7.5 STRUCTURAL STEEL WORK QUALITY CONTROL & TESTING REQUIREMENTS**

#### **7.5.1 General**

##### **7.5.1.1 Scope of Specification**

The scope of work of these specifications is to establish the norms for ensuring the required Quality Control through established testing norms of the welded structural steelwork.

##### **7.5.1.2 Codes / Standards**

Relevant IS codes for tolerance and tests of welding procedures as specified in the specification for Structural Steelwork -General.

##### **7.5.1.3 Submittals**

The Contractor shall submit the following:

- Proposed overall schedule for documentation of calculations, shop drawings, plan/procedures and records, submission of procedure of fabrication.
- The contractor shall himself inspect all materials, shop work and field work to satisfy the specified tolerance limits and Quality norms before the same are inspected by Engineer or his authorized representative.

##### **7.5.2 Products**

Not Applicable

##### **7.5.3 Execution**

##### **7.5.3.1 Tolerances**

The contractor shall through appropriate planning and continuous measurements in the workshop and the erection at site, ensure that the tolerance specified below are strictly adhered to.

**7.5.3.1.1 Dimensional & Weight Tolerance**

The dimensional and weight tolerance for rolled shapes shall be in accordance with IS: 1852. The acceptable limits of straightness for rolled or fabricated members as per IS:

7215 are:

Struts and columns:  $1/1000$  or 10 mm whichever is smaller  
Where L is the length of finished member

A limit for distortion in transverse direction 5 from the true axis of plate and box girder shall not be more than  $L/1000$  where L is the length of diagonal of profile.

Tolerance in specified camber of members shall be 3mm in 12m length

Tolerance in specified lengths shall be as follows:

Column finished for contact bearing	$\pm 1$ mm
Other members (cols.) upto and over 10 m	$\pm 5$ mm
Including 10 m $L/2000$ sub to max of	$\pm 8$ mm
Other members (beams) upto 12 m	$\pm 3$ mm
Over 12m $L/4000$ submax. Of	$\pm 5$ mm

**7.5.3.1.2 End of Members**

Beam Jo beam and beam to column connection -Where the abutting parts are to be jointed by butt welds, permissible deviation from the squareness of the end is  
Beam upto 600 mm in depth : 1.5 mm

Beam over 600 mm in depth: 1.5 mm for increase in depth of every 600 mm subjected to max of 3 mm.

Where abutting parts are to be joined by bolting through cleats or end plates, the connections require closer tolerance, permissible deviation from the squareness of the end is:

Beams up to 600 mm in depth 1 mm per 600mm of depth subject to a max of 1.5 mm.

For full bearing, two abutting ends of columns shall first be aligned to within 1 in 1000 of their combined length and then the following conditions shall be met:

- Over at least 80% of the bearing surface the clearance between the surfaces does not exceed 0.1mm.
- Over the remainder of the surfaces the clearance between the surfaces does not exceed 0.3 mm.

Where web stiffeners are designed for full bearing on either the top flange or the bottom flange or both, at least half the stiffener shall be in positive contact with the flange. The remainder of the contact face could have a max. gap of 0.25 mm.

**7.5.3.1.3 Depth of Members**

Acceptable deviation from the specified overall depth as per IS:7215 (1974) is:



Upto and including 1000mm : 1.0mm  
Over 1000 mm : 2.0mm

**7.5.3.1.4 Web Plates**

An acceptable deviation from flatness in girder webs in the length between the stiffeners or in a length equal to the girder depth shall be:

Upto 500 mm depth 0.5 mm  
Over 500 mm & including 1000 mm 1.0 mm  
Over 1000 mm 2.0 mm

**7.5.3.1.5 Flange Plates**

A reasonable limit for combined warpage and tilt on the flanges of a built-up member is 1/200 of the total width of flange or 2 mm whichever is smaller measured with respect to centerline of flange.

Lateral deviation between centre line of web plate and centre line of flange plate at contact surfaces measured as the difference  $\delta$  between diagonals of nominal length L shall not be greater than  $L/1000$ .

**7.5.3.1.6 End Milling**

Column ends bearing on each other or resting on base plates and compression joints designed for bearing shall be milled true and square to ensure proper bearing and alignment. Base plates shall also have their surfaces milled true and square.

**7.5.3.2 Quality Control**

In order to exercise proper control of the quality of the welding, Contractor shall enforce methods of control as tabulated below:

Purpose	Control Subjects	Methods of control
1. Control of welding Materials and basic metal quality	Quality control of electrodes, welding wire, flux and protective gases  Checking of quality and Weldability of the basic metal and welded members	Weldability test to determine the technological properties of materials.  Mechanical test of weld metal  Metallographical investigations of welds macro-structure and microstructure  Checking of weld metal resistance for intercrystalline corrosion. Study of weld metal solidity by physical control methods.

2. Checking of welder qualifications	Welding of specimens for quality determination	Mechanical tests, metalographical investigation & checking of welded joints by physical control methods
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### 7.5.3.3 Tests & Testing Procedures

Agency for testing of weld shall be approved by the Engineer prior to testing.

#### 7.5.3.3.1 Visual Examination

The contractor shall conduct visual examination and measurement of the external dimensions of the weld for all joints. Before examining the welded joints, areas close to it on both sides of the weld for a width not less than 20 mm shall be cleaned of slag and other impurities. Examination shall be done by a magnifying glass which has a magnification power of ten (10) and measuring instrument which has an accuracy of  $\pm 0.1$  mm or by weld gauges. Welded joints shall be examined from both sides. The contractor shall examine the following during the visual checks.

- i) Correctness and shape of the welded joints
- ii) Incomplete penetration of weld metal.
- iii) Influx
- iv) Burns
- v) Unwelded craters
- vi) Undercuts
- vii) Cracks in welded spots and heat affected zones
- viii) Porosity in welds and spot welds
- ix) Compression in welded joints as a result of electrode impact while carrying out contact welding
- x) Displacement of welded element

The contractor shall, document all data as per sound practices.

#### 7.5.3.3.2 Mechanical Test

The Contractor shall carry out various mechanical tests to determine weldability, metal alloyability, and nature of break, correct size and type of electrodes, degree of pre-heat and post-heat treatment. The type, scope and sample of various mechanical tests shall be determined in agreement with the purchaser. The number of tests conducted shall depend on the result obtained to satisfy the Engineer that the correct type and size of electrode, degree of preheating and post-heating and weldability of metal are being followed.

#### 7.5.3.3.3 Dye Penetration Test

All welds shall be tested by "Dye Penetration test" as per current practices.

**7.5.3.3.4 Radiography Test**

Radiography test shall be conducted by the contractor to determine gas inclusion (blow holes, hollows) slag inclusion, shallow welds and cracks for 25% lengths all butt joints.

Before conducting the examination, the welded joints shall be cleaned of slag and scales and visually examined. The welds shall be marked into separate portions depending on the length of photograph. The length of photograph shall be such as to ensure that there are no distortions and shall reveal the defect correctly. The length shall not be more than 0.75 of the focal distance and the width of the photograph would depend on the width of the welded joint plus 20mm on either side of the weld. The cassette with film shall be protected by sheet of lead or equivalent of proper thickness against incidental, diffused and secondary radiation.

The direction of the ray with relation to the film shall be as specified hereunder.

Welds of butt joints without edge slopes with edge processing shall be examined by central ray directed at right angles to the weld.

In special cases examination of welds with inclined rays directed along edge slopes may be permitted by the Engineer.

Lap joints shall be examined by directing rays at 45 degree to the bottom plate. Welds in T-joints without any edge preparation shall be examined by rays directed at 45 degree to the weld. Angle welds in lap and tee-joints shall be examined by the rays in opposite direction i.e. the film will be on the side of the weld. Weld in angle joints shall be checked by directing ray along the bisector of the angle between the welded elements. Opposite direction of the ray and location of the film may also be permitted by the Employer.

**7.5.3.3.5 Ultrasonic Test**

Ultrasonic test shall be conducted by the contractor to detect gas inclusion (pores), slag inclusion, shallow welds, cracks, lamination and friability etc. Prior to starting of ultrasonic test the welded joint shall be thoroughly cleaned of slag and other material. Surface of the basic metal adjacent to welded joint on both sides shall be mechanically cleaned by the grinder or a metal brush to provide the contact of the whole ultrasonic probe surface with surface of basic metal. The width of the clean surface shall be as directed by the Engineer. The welded joint then shall be covered with a thin coat of transformer oil, turbine or machine oil to ensure acoustic contact. The joints so treated shall be marked and the marks shall be entered into the documentation, subsequent to this, ultrasonic test shall be carried out as directed by the Engineer. At least 50% of weld shall be tested by ultrasonic testing.

**7.6 STRUCTURAL STEEL SPECIFICATIONS -ERECTION****7.6.1 General****7.6.1.1 Scope of Specification**

This Specification covers the delivery to site, storage and erection of structural steelwork at site. This includes plant and equipment requirements, installation of fabricated steel work position and grouting all complete as per drawings, specifications and other provisions of the Contract.

**7.6.1.2 Submittals**

- A. Ref. Specification for Structural Steelwork -General
- B. The contractor shall submit for approval a full description of his proposed erection method including sequence of erection, use of temporary supports, connection details and erection camber diagram and design calculations covering various stages of erection process.

**7.6.2 Products**

Not applicable

**7.6.3 Execution****7.6.3.1 Delivery, Storage & Handling**

- A. Before the shop assembling is dismantled, all members and sections shall be appropriately marked with paint or grooved with their identification numbers as detailed in shop drawings.
  - B. The Contractor shall deliver the fabricated structural steel materials to site, with all necessary field connection materials, in such sequence as will permit the most efficient and economical performance of the erection work. As per scheduled programme, the Engineer may, at his discretion prescribe or control the sequence of delivery of materials.
  - C. Fabricated parts shall be handled and stacked in such a way-that no damage is caused to the components. Measures shall be taken to minimize damage to the protective treatment on the steelwork. All work shall be protected from damage in transit. Particular care shall be taken to stiffen free ends, prevent permanent distortion and adequately protect all machined surfaces. All bolts, nuts, washers, screws, small plates and articles generally shall be suitably packed and identified.
- Plant and Equipment

**7.6.3.2 Plant and equipment**

All erection tools and plant & equipment proposed to be used shall be efficient, dependable and in good working condition, and the suitability and adequacy of such shall be determined by the Engineer. The Contractor shall, in his technical proposal submittal, specify the plant and equipment proposed by him for erection of structural steelwork at Site.

**7.6.3.3 Storage**

Materials to be stored shall be placed on skids above the ground and shall be kept clean and Properly drained.

**7.6 3.4 Method and Sequence of Erection**

The method and sequence of erection shall have the prior approval of the Engineer. The contractor shall arrange for the most economic method and sequence consistent with the drawings and Specifications and such information as may be furnished to him prior to the execution of the Contract. The erection of steelwork shall be planned so as to ensure safe- working conditions at all times. The Contractor shall be solely responsible for enhancing the safety of his construction activities at Site.

**7.6.3.5 Assembly & Erection**

- A. During erection, the members and sections shall be accurately assembled as shown on the approved shop drawings and any match marks shall be followed. The material shall be carefully handled so that no sections will be bent, broken or otherwise damaged. Hammering which will damage or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled. Splices and field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins) before bolting with high-strength bolts. Fitting-up bolts shall be of the same nominal diameter as the high-strength bolts, and cylindrical erection pins shall be 1 mm or larger.
- B. The correction of minor misfits involving harmless amounts of reaming, cutting and chipping will be considered a legitimate part of the erection. However, any error in the shop fabrication or deformation resulting from handling and transportation which prevents the proper assembling and fitting up of parts by the moderate use of drift pins or by a moderate amount of reaming and slight chipping or cutting, shall be reported immediately to the Engineer and his approval of the method of correction obtained. The contractor shall be responsible for all misfits, errors and injuries and shall make the necessary corrections and replacements.
- C. The straightening of plates, angles, other shapes and built-up members, when permitted by the Engineer, shall be done by methods that will not produce fracture or other damages. Distorted members shall be straightened by mechanical means or, if approved by the Engineer, by the careful planned and supervised application of a limited amount of localized heat, each application subject to the approval of the Engineer.
- D. The responsibility in respect of temporary bracing and guys shall rest with the Contractor until the structural steel is located, plumbed, leveled, aligned and grouted within the tolerances permitted under the Specification, and the permanent bracing/framing system has been installed.
- E. The temporary guys, braces, false work and cribbing shall not be the property of the department and may be removed by the Contractor, with the approval of the Engineer, without any charge, once the permanent framing system has been installed -to the satisfaction of the Engineer and when the temporary bracing, guys etc. can be removed without any potential danger/damage to the erected structure.

**7.6.3.6 Setting Out**

- A. Positioning and levelling of all steelwork, plumbing and placing of every part of the structure with accuracy shall be in accordance with the approved drawings and to the satisfaction of the Engineer. The Contractor shall check the positions and levels of the anchor bolts etc. before concreting and ensure that they are properly secured against disturbance during pouring operations. The Contractor shall remain responsible for correct positioning and shall set proper screed bars to maintain proper level. No extra payment shall be made on this account.
- B. No permanent field connections by bolting shall be carried out until proper alignment and plumbing guides have been attached.

**7.6.3.7 Field Bolting**

- A. Bolts shall be inserted in such a way that they remain in position under gravity, even before fixing the nut. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible materials. When assembled all joint surfaces including those adjacent to the washers shall be free of scales. They shall be free of dirt, loose scales, burns and other defects that would prevent solid seating of the parts.
- B. Holes for turned bolts to be inserted in the field shall be reamed in the field. All drilling and reaming for turned bolts shall be done only after the parts to be connected are assembled. Tolerances applicable in the fit of the bolts shall be in accordance with relevant Indian Standard Specifications.
- C. All high tensile bolts shall be tightened to provide when all fasteners in the joint are tight, the required minimum bolt tension as per relevant Indian Standard/Specification.
- D. The manufacturing and use of high strength friction grip (HSFG) bolts shall comply with the requirements of IS:3757 (1985).
- E. Load indicating bolts or washers may be used, subject to the approval of the Engineer.

#### **7.6.3.8 Holes, Cutting and Fitting**

- A. No cutting of sections, flanges, webs, and cleats, rivets, bolts, welds etc. shall be done unless specifically approved and / or instructed by the Engineer.
- B. The erector shall not cut, drill or otherwise alter the work of other trades, or his own work to accommodate other trades, unless such work is clearly specified in the Contract, or directed by the Engineer. Wherever such work is specified, the Contractor shall obtain complete information as to size, location and number of alterations, prior to carrying out any work.

#### **7.6.3.9 Drifting**

- A. Correction of minor misfits will be considered as permissible. For this, light drifting may be used to draw holes together and drills shall be used to enlarge holes, as necessary, to make connections. Reaming, that weakens the member or makes it impossible to fill the holes properly or to adjust accurately after reaming, shall not be allowed.
- B. Any error in shop work which prevents proper assembling and fitting of parts by moderate use of drift pins and reamers shall immediately be brought to the attention of the Engineer, and approval of the method of correction obtained. The use of gas cutting torches at the erection site is prohibited.

#### **7.6.3.10 Grouting**

- A. The positions to be grouted shall be cleaned thoroughly with compressed air jet and wetted with water, and any accumulated water shall be removed. Grouting shall be carried out under expert supervision taking care to avoid air locks. Edges shall be finished properly.
- B. Whatever method of grouting is employed, the operation shall not be carried out until the steelwork has been finally levelled. Immediately before grouting, the space under steel is thoroughly cleaned. Where packing is to be left in place, they shall be placed such that they are completely covered with grout.
- C. The grout to be used shall be Non-shrink grout Conbextra GP-2 of M/S Fosroc or equivalent.

- D. All steel in foundations shall be solidly encased in Portland Cement Concrete of minimum characteristic strength at 28 days as specified in the drawings, subject to a minimum of 35 N/mm<sup>2</sup>. A minimum cover of 100mm shall be provided to all steelwork where surrounding concrete is in contact with soil.

#### **7.6.3.11 Inserts and Embedment**

Various steel inserts and embedments are required under the contract to be fabricated, positioned and secured firmly into place inside the formwork prior to concrete being poured. There are also requirements of jointing, threading, bolting and welding inserts and embedments of different concrete and structural steel elements in order to establish structural continuity and connection. Great care shall be exercised by the contractor in executing all aspects of the work related to inserts and embedments, including tolerances, so that the final assembly of the concrete elements can meet satisfactorily the continuity requirements intended in the structure.

#### **7.6.3.12 Painting after Erection**

- A. Steelwork coated with rust inhibitor shall not be left exposed for a period exceeding 15 days. Otherwise, such steelwork shall be re-cleaned and re-coated with such finish until encased in concrete.
- B. No steelwork with shop paint shall be left exposed at site for a period exceeding than that approved by the Engineer.
- C. The surfaces required to remain unpainted at shop, shall be given a protective coating after the structure is erected, levelled, plumbed, aligned in its final position, and accepted by the Engineer. However, touch up painting, making good any damaged shop painting and completion of any unfinished portion of the shop coat shall be progressively carried out by the Contractor.
- D. Painting shall not be done in frost or foggy weather, or when humidity is such as to cause condensation on the surfaces to be painted. Before commencing painting of steel, which is delivered unpainted, all surfaces to be painted shall be dried and thoroughly cleaned from all loose scale and rust.
- E. All field bolts, welds and abrasions to the shop coat, and surfaces delivered unpainted from fabrication shop, shall receive the full protective treatment as specified in Table defined in painting specifications before delivery to Site.
- F. Surfaces, which will be inaccessible after field assembly, shall receive the full specified protective treatment before assembly. Bolts and fabricated steel members, which are galvanized or otherwise treated, shall not be painted.
- G. The contractor shall be responsible for any damage caused to other components of the structure including the substructure. In particular, he shall take all necessary precautions to minimize concrete splash onto completed steelwork or rust staining of concrete due to erected steel work and clean and/or repair all stains and other damages to completed work prior to tests on completion.

#### **7.6.3.13. Final Cleaning up**

Upon completion of erection, and before final acceptance of the work by the Engineer, the Contractor shall remove, free of cost, all false work, rubbish and all temporary works, resulting from or in connection with the performance of his work.





**S.08: PILE FOUNDATIONS****8.1 General:****A. Piling plant and Methods:**

Suggested method for piling is bored cast in-situ piles with hydraulic drilling rigs using partial depth casing with Polymer slurry and oscillator arrangement.

- i. Not less than 2 weeks before any piling work is commenced, the Contractor shall submit to the Engineer for approval, full details of his proposed piling plant and detailed method statements for carrying out the Works. Details of casings and concreting methods in respect of bored cast in-situ concrete piles are to be provided.
- ii. The Contractor shall not commence any piling until the plant and methods which he proposes to use have been approved by the Engineer but such approval shall not relieve the Contractor from any of his obligations and responsibilities under the Contract. If for any reason the Contractor wishes to make any change in the plant and methods of working which have been approved by the Engineer, he shall not make any such change without having first obtained the Engineer approval thereof.
- iii. List and nos. of equipments, accessories proposed to be used for the present job shall be submitted along with the technical bid.

**B. Records:**

The Contractor shall keep complete records of all data required by the Engineer covering the boring operations, reinforcement cage lowering and concreting procedure of each pile and shall submit two signed copies of these records to the Engineer, in the format given in the specification or as approved by the Engineer within two days of completion of concreting of the pile.

**C. Programme and Progress Report:**

- i. The Contractor shall inform the Engineer each day about the programme of piling for the following day and shall give adequate notice of his intention to work outside normal hours and at weekends, where approved.
- ii. The Contractor shall submit to the Engineer on the first day of each week, or on such other date as the Engineer may decide, a progress report showing the rate of progress to that date and progress during the previous week or period of all main items of piling works, as required by the Engineer.

**D. Setting Out:**

The Contractor shall establish and maintain permanent datum level points, base lines and grid lines to the satisfaction of the Engineer and shall set out with a suitable identifiable pin or marker, the position of each pile. The setting out of each pile shall be agreed with the Engineer at least 8 working hours prior to commencing work on a pile and adequate notice for checking shall be given by the Contractor.

Notwithstanding such checking and agreement, the Contractor shall be responsible for the correct and proper setting out of the piles and for the correctness of the positions, levels, dimensions and alignment of the piles.

- E. After all piles are cast and weak concrete is chipped out, the Contractor shall submit the drawing showing the exact location of piles with respect to the Pier/column centre line.

**F. Disturbances and Noise:**

- i. The Contractor shall carry out the piling work in such a manner and at such times as to minimize noise and disturbance. The pile driving operation can produce noise levels upto 100 dB(A) at a distance of 25m from the site. Using a sound absorbent could reduce the noise levels. This can reduce the noise levels to 70dB(A) at a distance of 15m from the piles. The safety and precautions as stipulated in IS:5121 (1969) "Safety Code for Piling and other Deep Foundation" need to be adopted.
- ii. The Contractor shall take precautions adequate enough to avoid damage to existing services and adjacent structures. IS: 2974 (Part 1) - 1982 may be used as a guide for studying qualitatively the effect of vibration on persons and structures. In case of deep excavation adjacent to piles, proper shoring or other suitable arrangement shall be done to guard against the lateral movement of soil stratum or releasing the confining soil stress. Any such damage shall be repaired by the contractor to the satisfaction of the Engineer.
- iii. The Contractor shall ensure that damage does not occur to completed piling works and shall submit to the Engineer for approval, his proposed sequence and timing for driving or boring piles having regard to the avoidance of damage to adjacent piles.

**G. Obstructions:**

If during the execution of the Works the Contractor encounters obstructions in the ground, he shall forthwith notify the Engineer accordingly, submit to him details of proposed methods for overcoming the obstruction and proceed according to the Engineer's instructions.

**8.2 Scope of Work:**

- a) These specifications cover the works of providing pile foundations. Work included consists of all necessary services and furnishing of all labour, material, tools, equipment and related items for the full and satisfactory performance of the contract, conforming to these specifications and as shown in the Contract Drawings or reasonably implied therein or any authorised conditions or alterations thereof.
- b) The tenderer is advised to visit the site and familiarise himself with the conditions at site. The Engineer shall not be held responsible for the accuracy of the soil data, furnished in good faith with the tender.
- c) The construction of piles shall be in accordance with the following Indian Standard Codes of Practice for Design and Construction of Pile Foundations: IS: 2911-2010 Part I Section 2 Bored Cast in-situ Concrete Piles Or IRC:78 Standard specifications and code of practice for road bridges Foundation And Substructure

- d) With the tender the Contractor shall submit the detailed method of construction to be used. For cast-in-situ concrete piles the Contractor shall indicate the methods he proposes to concrete the piles in order to prevent necking of piles.
- e) The items of work will generally be as follows:
  - i. Boring/drilling including provision of temporary casing/permanent casing
  - ii. Supplying, fabrication, and placement of all reinforcing bars.
  - iii. Casting of concrete piles as per specifications.
  - iv. Load testing of piles.

### 8.3 Materials:

#### a. General:

Unless otherwise specified in this section all materials shall conform to the requirements specified in separate sections for Concrete, Formwork and Reinforcement.

#### b. Cement:

The cement to be used for piling and all foundation work shall be conforming to following Indian Standard Specifications:

- i. 53 grade Ordinary Portland Cement conforming to IS:269 – 2015
- ii. IS:16714:2018 Specification of GGBS for Use in Portland cement by blending process, and for making concrete by direct addition shall be limited to 40% of the cement in Substructure component such as Pile, Open Foundation and Pile Caps.
- iii. As an alternative to (ii) above PSC Cement conforming to IS: 455 specifications for Portland slag cement (PSC) can be used.
- iv. Cement shall be free from lumps and caking.

#### c. Concrete Mix Design:

The concrete shall be M35 or as specified in the approved drawings. The maximum size of coarse aggregate shall not exceed 20mm. For sub aqueous concrete, the requirements specified in IS 456 shall be followed. For cast-in-situ piles, concrete with a slump of 150 to 180mm (consistent with the method of concreting) will be required. For slumps more than 150mm the workability should be tested by "determination of flow" as per IS: 9103. Minimum cementitious content for design mix shall not be less than 400 kg/m<sup>3</sup> of concrete in piling. For piling, quantity of cement shall be as per the design mix or the minimum cement content whichever is greater shall be used. For improving resistance against chlorides and sulphates from surrounding soils or water, mineral admixture such as GGBS is preferred to be used.

For underwater concreting the provisions of relevant para of IS 456 shall be followed.

Chemical Admixture used in the Mix Design shall conform to specification mentioned in S.03 of Section-VII-F.

The contractor shall submit mix design calculations and get the same approved by the engineer well before the starting of installation of piles and carry out adequate numbers of tests to ensure the minimum specified strength as indicated in drawings.

The concrete shall be properly graded, shall be self-compacting and shall not get mixed with soil, excess water, or other extraneous matter.

#### c. Concrete cube tests:

Concrete cubes shall be cast, tested and evaluated as specified in S.03 of Section-VII-F.

**d. Reinforcement:**

The reinforcement shall conform to the requirements specified in S.05 of Section-VII-F along with IS 2911 (Part 1/ Sec 2) and used as per the drawings, extending for the full length of the pile and shall project minimum 60 times the bar diameters above the cut off level or as specified in the drawing. Only circular concrete cover blocks threaded on to the helix shall be used for ensuring the specified cover. Minimum clear cover to the reinforcement shall be 75 mm, unless otherwise mentioned.

**e. Temporary Casings and Tremie Pipes:**

Temporary casings, as approved by the Engineer, shall be used to maintain the stability of pile bore hole. The casings and tremie pipes shall be in mild steel. The temporary casing plates shall have adequate wall thickness and strength to withstand driving stresses, stresses due to soil pressure, etc. without damage or distortion all joints shall be watertight. The internal diameter of the casing shall not be less than the nominal diameter of pile. Temporary casings and tremie pipe shall be free of distortion and shall be of uniform cross-section throughout each continuous length. During concreting, they shall be free of internal projections and encrusted concrete which may prevent proper formation of the pile. The tremie shall be water-tight throughout its length and have a hopper attached at its head by a water-tight connection.

**f. Stabilizing Material:**

The stabilizing material (Polymer slurry used & quality control) to maintain the sides of pile bores shall have the properties as per requirement given below. Polymer slurry is obtained by mixing polymer powder with water in suitable proportion (1kg powder in 1000 litres of water) and the solution is thoroughly agitated so as to ensure uniform mixing of the polymer powder and water. The capacity of the mixing tank shall be more than 1.5 times of the volume of the bore hole for which the Polymer is to be used.

For mixing of polymer powder with water and the subsequent pumping of slurry into bore, suitable capacity mixing tank (M.S tank) equipped with agitator & pumping arrangement shall be used.

However, Use of Bentonite as stabilizing material is not permitted.

Polymer slurry shall satisfy the desired properties at all times:

- a) Marsh cone viscosity 60-70 seconds/qt (900 ml-One cone volume)
- b) Specific gravity 1.05 to 1.07
- c) PH value 8 to 10
- d) Sand Content by mud balance method - 0.25 % to 2%

**8.4 Test Bores (150mm Dia)**

- a. Bore hole shall be made as per IS 1892 for determining (which is one of the criteria of establishing) start of socketing horizon and termination level of piles. Standard Penetration Test (SPT), as per IS 2131, in a bore hole shall be conducted at 1.0 m intervals in the overburden soil and rock portion having core recovery  $\leq 30\%$ .

- b. Number of bore holes for determining termination shall vary depending on the site condition and as decided by the Engineer. Generally, one borehole shall be done at each Pier location.

c.

## 8.5 Cast In-Situ Bored Piles:

### A. General:

- i Diameters of the piles shall be the concrete shaft diameters and shall not be less than the diameters specified in the drawing.
- ii Bore hole data provided by the Employer for construction are only indicative in this regard and it is the contractors' responsibility to make correct assessment of ground conditions before starting the piling operation. Depth of piles is likely to vary, and contractor shall have no claim whatsoever irrespective of the depth of piles provided at any and all locations.
- iii These shall be formed by boring to the founding strata specified in the drawings or as directed at site. The sides of the boring shall be prevented from collapsing by one of the following means
  - iv Permanent mild steel liner (cased pile)
  - v Removable/temporary mild steel casing (uncased pile).
- vi Bored cast-in-situ piles shall conform to IS 2911 (Part 1/ Section 2) and IS 14593, where not contravening to the following provisions. Based on borehole reports and drawings, Method Statement for the piles shall be established by the Contractor before commencement of the work and the same shall be submitted to the Engineer for obtaining his approval. Installation of piles shall be carried out as per pile layout drawings, installation criteria, approved Method Statement and instructions of the Engineer. Any changes to the pile design, based on test-piles results, borehole data or soil conditions encountered during boring, shall be as instructed by the Engineer.
- vii During boring, the Contractor shall, where required by the Engineer, take soil, rock or ground water samples and transport them to an approved testing laboratory to carry out soil tests as directed.
- viii The method adopted shall be chosen giving due consideration to the subsoil data, ground water conditions and to the other relevant conditions at site as well as to the presence of adjacent structures.
- ix Before installing the initial test pile, the Contractor shall finalise the pile testing arrangement and obtain approval of the Engineer. It is envisaged that the working piles shall be installed after the successful completion of the initial pile load test.
- x The bottom of the steel lining shall be sufficiently deep in advance of the boring tool so as to prevent settlement of outside soil and formation of cavities.
- xi Removable mild steel casings shall be used only with extreme caution. Individual casings shall be joined together by screwing or any other approved method and not by direct butting with external lug connections. The inner surface of casings shall be smooth and free of all internal projections.
- xii The Contractor shall record all the information during installation of piles, including pile-bore observations before concreting each pile. The data sheet for recording pile data shall be as approved by the Engineer. On completion of each pile installation, pile record shall be submitted to the Engineer within two days of completion of concreting of the pile.

- xiii The contractor shall set out piles with precision survey duly erecting permanent benchmarks and other references. He shall be responsible for correct maintenance of position and plumb thereafter and these shall be checked periodically.
- xiv Control of Position & Alignment: Piles shall be installed as accurately as possible according to the drawings either vertically or to the specified batter. All deviations will be measured at the cut off level of the piles. The deviation from the true axis shall not be more than 1.5% for vertical piles and 4% for rake piles. Piles should not deviate in location by more than 75mm when used in groups. For single or 2 piles used under columns, deviation shall not be more than 50mm. The Contractor shall maintain a record of actual pile locations in the form of drawing and submit the information to the Engineer at suitable intervals.

**B. Boring:**

- i Boring shall be done using hydraulic drilling rigs with oscillator arrangement suiting to different kinds of strata encountered.
- ii The size of cutting tools shall not be less than the diameter of the pile by more than 75 mm. However, the size of cutting tool shall be chosen by contractor depending on the type of substrata and equipment employed by contractor so that executable pile shall not have diameter less than nominal diameter of pile as specified in drawing.
- iii The boring centre shall be aligned with the pile centre and the boring machine shall be installed so as not to move or incline. The sides of the bore-hole shall be stable throughout.
- iv Working level shall be above the Cut-off-Level. After the initial boring of about 1.0 m, temporary guide casing of suitable length shall be lowered in the pile bore for vertical pile. The diameter of guide casing shall be such as to give the necessary finished diameter of the concrete pile. The centre line of the guide casing shall be checked before continuing further boring. Guide casing shall be minimum of 1.0 m length. Additional length of casing may be used depending on the condition of the strata, ground water level etc.
- v The temporary guide casing (if provided) shall be withdrawn cautiously, after concreting is done up to the required level. While withdrawing the casing, concrete shall not be disturbed.
- vi For providing permanent MS liner, Clause 709.1.4 of IRC: 78 shall be complied. Wherever stricter provision has been given in the drawings, the same shall be followed. The Contractor shall fabricate MS liners from MS sheets to suit to the diameter of the pile. The required length of the liners will be made up by welding each unit at site. The thickness of the liners shall not be less than 6 mm and for the bottom length of 1.2 m or such increased length as decided by the Engineer, the thickness can be increased suitably. The bottom end of the MS liners shall be stiffened by welding additional plates to withstand the impact during driving.
- vii The piles shall be founded on hard rock or other suitable strata as approved by the Engineer.
- viii Piling shall be done by using hydraulic rig with temporary liner. Use of liner (for the top 4 to 6 meters from ground level or more depth, to protect loose soil falling in bore hole) as directed by engineer, is essential. No extra payment shall be made to the contractor for using temporary liner over the item of piling as in BOQ/Design and build contract.
- ix Use of drilling mud in stabilizing sides of the pile borehole may also be necessary together with temporary or permanent casing wherever sub soil

and ground water conditions are likely to cause mud flows or instability of pile bore or sand boiling. However, this will be permitted only when deemed necessary by the Engineer.

- x Consistency of the stabilizing material suspension shall be controlled throughout concreting operations in order to keep the bore stabilized, as well as to prevent concrete getting mixed up with the thicker suspension of the mud.
- xi After the installation of temporary casing, the drilling operation will continuously proceed together with the application of the Polymer slurry.
- xii Boring operation shall be carried out further by using the shaft stabilization slurry (Polymer Slurry). The drilling operation shall proceed together with the mixing of the Polymer Slurry. Once the pumping of polymer slurry into the bore is initiated, the bucket or auger is then rotated to mix the Polymer slurry along the Pile shaft.
- xiii Prior to preparation of the bore stabilising slurry, cleanliness and water tightness of storage tank shall be ensured. pH value of fresh water shall be between 7 to 9.
- xiv The site conditions and drilling diameter of bore holes may affect the usage ratio of polymer in the mixture and as well as its viscosity.
- xv During concreting activity, the flushed out Polymer fluid will be collected in storage tanks by pumping back. There is no hazardous effect of this bore stabilising fluid on environment. The Polymer slurry level shall not be kept below the bottom level of Steel Casing. The slurry shall be tested periodically and the results will be submitted to the Engineer. Prior to placing of concrete in the borehole, make sure that heavily contaminated slurry, which could impair the free flow of concrete from the tremie pipe, has not accumulated in the bottom of the borehole. For this, the borehole shall be kept untouched after reaching the desired depth for 1 to 2 hours so as to allow the suspended particles of the polymer to settle down. Then the bore hole shall be cleaned by cleaning bucket before pouring the concrete.
- xvi When borehole is stabilised by casing and drilling mud or by maintaining water head using temporary/permanent casing, the bottom of the hole shall be cleaned very carefully before concreting work is taken up. Cleaning / flushing methodology shall be submitted for the approved of the Engineer prior to commencement of piling.
- xvii Where mud flow conditions exist or the aggressive action of ground water is to be avoided, or in the case of piles built in water or in cases where significant length of piles could be exposed due to scour - the casing should be left permanently in the ground with 8 mm thick permanent liners as directed by Engineer-in-charge.
- xviii The quantum of steel required in liners up to depth of cut off level shall be measured as per drawing though the liner might have been provided right from the level of the working platform on practical considerations, since the length of the permanent liner above the cut-off level has to be necessarily removed by gas-cutting for facilitating peeling of the top portion of the pile and for interlacing its reinforcement bars into the capping slab. There is however, no objection if the surplus pieces (if cut and removed carefully and then found reusable) are joined and are re-welded to required length for reuse in the same contract on some of the other piles. No claim shall be entertained for such pieces if the cut pieces cannot be reused by the Contractor in the aforesaid manner.

- xix Pumping from bore hole shall not be permitted unless a casing has been driven into a stable stratum which prevents flow of external ground water from other strata in significant quantities.
- xx In case of end bearing piles founded on hard rock, cutting of rock by hydraulic rig using diamond bits will be resorted to. Scheme adopted shall be such that the noise and vibration parameters specified in tender documents /Environment manual are not violated. Drilling in rock shall be carried out by hydraulic rig using diamond bits. Hydraulics rigs of suitable capacity (in terms of rpm and torque) to be able to bore in hard rock strata shall be deployed.
- xxi In case of dry bores, inspection shall be carried out from the ground surface for bores having diameter less than 750mm. For larger diameter bores equipment shall be provided to enable the Contractor and the Engineer or their representatives to descend into the boring for the purpose of inspection with all necessary safety precautions.
- xxii Care shall be taken not to harm a recently concreted pile due to driving the casing nearby before the concrete has sufficiently set in that pile. The danger of doing harm is greater in compact soils than in loose soils.

#### **Penalty on mishandling of Polymer slurry**

Mishandling of Polymer slurry (like splashing of Polymer slurry outside specified width of barricading or non-cleaning of tyres of dumpers and transit mixers before leaving the piling site thereby making the road dirty etc.) is strictly prohibited . Noncompliance of same shall attract a penalty as follows:

- i. On first observation - Rs. one lakh
- ii. On Second observation - Rs. two lakhs
- iii. On third and each subsequent observation - Rs. three lakhs

#### **8.6 Termination of Pile:**

- a) The boring depth shall be measured at two or more places to the bottom of the Hole immediately after completion of boring operations. The results shall be reported promptly.
- b) Pile shall be terminated at a design depth with a minimum socket length as mentioned in design document/drawing, or as directed by the Engineer-In-Charge.
- c) Approval of the termination depth of the pile by the Engineer shall, in no way, absolve the contractor on the integrity of the pile.
- d) For the purpose of socketing of end bearing pile in hard rock, the following criterion shall be satisfied:
  - When the crushing strength of the rock is more than characteristic strength of pile concrete, the rock encountered should be deemed as hard rock as per clause No.B7 of Annex-B, IS 2911- Part1/ Sec-2).
  - Rock will classify as hard rock if RQD > 75%.
  - Minimum Socketing depth in hard rock shall be as per approved drawing or as directed by the Engineer-In-Charge.
- e) For establishing the similarity of soil/rock strata actually met while advancing the pile-bore with the strata selected for terminating the pile , Pile Penetration Ratio (PPR) shall be used in this method as per clause No.10 of IRC-78:2014.
- f) Pile Penetration Ratio (PPR) of rock strata encountered, used for termination of pile shall be confirmed by Initial Pile Load tests, Routine pile Load tests and also co-related with the Unconfined Compressive strength of rock strata and also RQD values.



- g) As the resistance to rock cutting increases, RPM decreases, and Kelly bar pressure is required to be increased, i.e., increasing the torque. This is reflected in the torque- RPM curve.

#### **8.7 Cleaning of borehole:**

- a) After completion of borehole upto the required depth, the borehole shall be cleaned as per clause 8.3 of IS : 2911 (Part 1/Section 2).
- b) When the boring is done by rotary drilling rigs, cleaning-bucket attached to the Kelly shall be used for cleaning the bore. Wherever stabilizing material is used, after using the cleaning-bucket, the bore shall be flushed with fresh slurry.
- c) Pile bore shall be cleaned by fresh stabilizing material through tremie pipe or as specified in the Method Statement, before (in case delay in concreting after the completion of bore) and after placing the reinforcement cage and just before the start of concreting. Pile boring shall be inspected and approved by the Engineer, in accordance with approved Method Statement, before concreting.
- d) The Contractor shall measure the final depth after this cleaning, when there is a delay in concreting after completion of the bore, for knowing the casting pile length, and confirm its effect by comparing with the depth at the end of boring.

#### **8.8 Reinforcement Steel:**

- a) The reinforcement shall be assembled before placing in the moulds and all hoops and links shall be of uniform length firmly wired into position. Ends of helical reinforcement, if used, shall be firmly secured. Diagonal fork spacers shall be of a pattern that has been approved by the Engineer.
- b) Joints in main longitudinal bars will be permitted only where, in the opinion of the Engineer, each bar cannot be supplied in one complete length. Where permitted, joints shall be provided in staggered manner at agreed locations, designed to develop the full strength of the bar across the joint, provided with adequate extra links or stirrups and staggered in position from those of adjacent longitudinal bars, all to the approval of the Engineer.
- c) All joints/laps in the longitudinal bars will be held in position by means of binding wire and tack welding. Nothing extra shall be paid for the welding of lap joints. The last one circle of helical stirrups at each end shall be welded to main longitudinal bars.
- d) **Lowering of the reinforcement cage:**  
The reinforcement cage shall be properly aligned with the pile core and kept vertical without collapsing the hole wall. In lowering of the reinforcement cage, it shall avoid deformations, damages, etc. by using reinforcing material as necessary. In the lap joint part of the reinforcement cage, the upper and lower cages shall be in a straight line, with the joints tightly bound.  
Proper cover to reinforcement and central placement of the reinforcement cage in the pile bore shall be ensured by use of suitable concrete spacers or rollers. cast specifically for the purpose, as directed by the Engineer. The longitudinal reinforcement shall project, minimum 60 times the dia. of reinforcement bar or as indicated in the drawing, above Cut-off-Level.  
After lowering of the reinforcement cage, the height of the top end of the reinforcement shall be measured and reported. The axes of the reinforcement cage and the pile core shall be matched, checked and reported.

#### **8.9 Concreting:**

- i Concreting shall not be done until the Engineer is satisfied that the termination level of pile, is as per the installation criteria and the Method Statement that has been approved by the Engineer.
- ii Prolonged delays in the commencement of concreting after the completion of the boring shall not be permitted. The time interval between the completion of boring and placing of concrete shall not exceed 6 hour.
- iii Concreting shall be done by tremie method. The operation of tremie concreting shall be governed by IS 2911 (Part 1/ Sec 2).
- iv The concrete shall have a minimum slump of 150mm in case of concreting in a water free bore. Suitable precautions shall be taken for prevention of segregation. Internal vibrators shall not be used unless the Contractor is satisfied that segregation will not result because of vibration and unless the method of use has been approved by the Engineer. It is essential that the water level within the pile bore be in equilibrium before commencement of concreting.
- v The concrete for piles underwater or in drilling mud shall be placed with a tremie pipe. The tremie pipe shall not be less than 200mm diameter for 20mm aggregate. The joint between the hopper and tremie pipe as well as the joints in the tremie pipe shall be watertight and the tremie pipes shall be thoroughly cleaned after each use.
- vi Concreting by tremie shall continue to allow the initial pours of concrete, mixed with stabilizing fluid, sludge and cut spoils from the bore to overflow and the consistency and quality of the over flowing concrete is comparable to that of design mix. The length of overflow shall be decided by the Engineer.
- vii The contractor shall also ensure that there is no reduction in poured concrete quantities. These calculations shall be based on consumption of concrete poured in bore (as recorded in bore log) and actual concrete required in bore on theoretical basis i.e. based on nominal diameter of pile and actual bore hole length (based on actual sounding of founding level). Above 5% reduction in consumption of poured concrete quantities in pile may be rejected.
- viii While concreting the tremie shall be withdrawn slowly ensuring adequate height of concrete outside the tremie pipe at all stages of withdrawal.
- ix The Contractor shall ensure that heavily contaminated drilling mud has not accumulated at the base of boring since this could impair free flow of concrete from the tremie pipe.
- x If the specific gravity of the drilling mud at the base of the bore exceeds 1.20 the placing of concrete shall not proceed.
- xi The first charge of concrete shall be placed in the hopper over a sliding plate of the bottom of the hopper. The charge should be adequate in volume to ensure flushing action to prevent mixing of water or drilling mud and concrete. Alternatively, floating plugs of approved specification may be used before the first charge of concrete.
- xii The tremie pipe shall at all times penetrate the previously placed concrete with adequate margin against accidental withdrawal. The tremie pipe shall not be withdrawn until the completion of concreting. At all times a sufficient quantity of concrete shall be maintained within the pipe to ensure that the pressure from it exceeds that from the seepage water.
- xiii Spot measurements shall be taken at suitable intervals to check that the tremie pipe has an adequate penetration into previous concrete.
- xiv Concreting of the pile shall be in one single and continuous operation. In case of long piles of large diameter, large size mixers or more mixers shall

be used so that the entire concreting operation is completed in not more than two hours.

- xv Temporary casings, when used, shall be extracted carefully to the satisfaction of the Engineer, whilst the concrete is sufficiently workable to ensure it is not disturbed or lifted, and the reinforcement cage does not get disturbed. During extraction, a sufficient quantity of concrete shall be maintained inside the casing to overcome the pressure from external water, soil or stabilizing material and to ensure that no reduction in section by way of necking or shearing of concrete and contamination of the pile takes place.
- xvi When a casing is being extracted a sufficient quantity of concrete shall be maintained within the bore to ensure the pressure from external ground water and soil is adequately exceeded by the pressure of concrete. Otherwise necking of the pile may result. A minimum embedment of 1.5 to 1.8 m is required.
- xvii Grouting at base of pile shall be done wherever the results of proof coring (in case of rock), sonic logging and/or loading test etc. confirm that there is a void/sludge at the pile base. The grouting shall be done with cement slurry under suitable pressure after concrete in the pile attains the desired strength. For this purpose, conduit pipes with easily removable plugs at the bottom end shall be placed in the bore along with reinforcement cage before concreting.
- xviii No concreting shall be placed in the bore once the bottom of the casing has been lifted above the top of concrete.
- xix The top of concrete in a pile shall be brought above the cut-off level since the top concrete is loose and is weak because of contamination with water/drilling mud. This ensures good concrete at the cut-off level.
- xx After each pile has been cast, any empty bore shall be protected and carefully backfilled as soon as possible with approved materials.
- xxi Complete boring and concreting records shall be submitted to the Engineer for each pile. The records shall include the duration of concreting, tremie lengths (individual and cumulative), tremie pipe lengths removed, theoretical sounding, actual sounding, actual lengths of pile concreted and the volume of concrete placed, cut off level, founding levels etc. For piles with temporary casings records of sequence of casing withdrawal and levels of concrete before and after withdrawal shall also be included in the reports.

#### 8.10 Cut-off-level ( COL)

- a) Cut off level of piles shall be as indicated in working drawings or as directed by Engineer.
- b) The top of concrete in pile cast shall be above the Cut-off-Level by 1.0 m (minimum) and as per the Method Statement, to remove all laitance and weak concrete and to ensure good concrete at Cut-off-Level, for the proper embedment into the pile cap. Any exceptions, due to contingent situation, will be subject to the approval of the Engineer.
- c) **Preparation of pile head:** The area surrounding the piles shall be excavated up to the bottom of the pile caps. After seven days of concreting of pile, the exposed part of concrete above the COL shall be removed or chipped off and made rough at COL. In case a part of extra-pile concrete before curing is handled, the Contractor shall obtain prior approval from the Engineer. The projected reinforcement above COL shall be properly cleaned and bent carefully, only where required, to the required shape and level to be anchored into the pile cap as per the drawing. While finishing the pile head, care shall be taken to ensure no harmful damage, such as cracks, occurs in

the concrete. The pile top shall be embedded into the pile cap by 150 mm or clear cover to reinforcement, as per the drawing and as agreed by the Engineer. All loose material on the top of pile head after chipping to the desired level shall be removed and disposed as per contractual procedure and as directed by the Engineer.

- d) In case of concrete being placed by tremie method and pile cut off level less than 1.0 meter below the ground level, concrete shall be cast to the piling platform level to permit overflow of concrete for visual inspection. In case COL of pile is more than 1.0 meter below working level then concrete shall be cast to a minimum of one meter above COL. Before concreting, contractor shall obtain the approval of the Engineer of the height above COL up to which the concrete is to cast.
- e) Any defective concrete in the head of the completed pile shall be cut away and made good with new concrete.
- f)

#### **8.11 Pile Cap:**

Pile caps shall be of reinforced concrete. A minimum offset of 150 mm shall be provided beyond the outer faces of the outer most piles in the group. If the pile cap is in contact with earth at the bottom, a levelling course of minimum 75 mm thickness of PCC of grade M15 shall be provided or as shown in the drawings.

The ground shall be excavated, levelled, prepared and then layers of coarse aggregate and blinding concrete shall be constructed below pile cap, conforming to Clause 2.0 of this Specifications and as per the drawings. The pile cap shall then be cast as per the drawings and conforming to specifications mentioned in S.03 & S.05 of Section-VII-F of this Technical Specifications, subject to tolerances mentioned therein.

The attachment of the pile head to the cap shall be adequate for the transmission of loads and forces. The top of pile after stripping shall project at least 150mm or clear cover to reinforcement or as per given in the drawing, into the pile cap. Concreting of the pile cap shall be carried out in dry conditions. All the operations and tools required for making the pile in dry condition is included in the item.

#### **8.12 Testing of Piles:**

- i) The Contractor shall conduct Load tests/Integrity Tests on Pile as described below in accordance with these specification and approved method statement. Cost of the same is deemed to be included in the contract price and nothing extra shall be payable to the contractor on this account.
- ii) When preparing for conducting a pile test, the Contractor shall follow the requirements of the various acts, orders, regulations and other statutory instruments that are applicable to the work for the provision and maintenance of safe working conditions, and shall in addition make such other provision as may be necessary to safeguard against any hazards that are involved in the testing or preparations for testing.
- iii) Full details of the equipment proposed to be used, the test setup and pile testing scheme along with detailed design, drawings shall be submitted to the Engineer, before making arrangements to carry out the tests, for obtaining his approval. Approval of the Engineer shall also be obtained after the test setup is complete, prior to commencement of loading.
- iv) The work shall include mobilization of all necessary equipment, anchor piles and rock anchors and anchor piles and rock anchors, providing necessary engineering supervision and technical personnel, skilled and unskilled labour as required, to carry out the complete pile testing and submission of test reports.

- v It is essential that all the equipment and instruments are properly calibrated both at the commencement and immediately after the completion of tests, so that they represent true values. If the Engineer desires, the Contractor at his own cost shall arrange for calibration of the instruments in presence of the Engineer, at a laboratory having Engineer's approval, and the test report and calibration certificate shall be submitted to the Engineer.
- vi The load tests shall be in accordance with the Indian Standard Code of Practice for Design and Construction of Pile Foundations IS 2911 (Part IV) Load Tests on Piles. For initial load test, test load will be 2.5 times the theoretical designed capacity of pile. For initial load, test arrangement to be designed shall also cater for additional 25% above test load and nothing extra will be paid on this account. Permissible stresses in test arrangement (steel truss or plate girder) to cater for test load plus additional 25% load shall be within permissible stresses as per IS: 800 (as for permanent structure). For test frame, steel of Grade -B conforming to IS: 2062 shall be used.
- vii Engineer will decide the locations of initial and routine (both lateral and vertical load tests). The Frequency or number of the Initial/Routine pile load test shall be as per IS: 2911 (Part IV). Notwithstanding to the above, the number of Routine Load test shall be 2 percent of the total number of piles required. Nothing Extra shall be payable to the contractor on this regard. The contractor shall undertake test piles required for initial pile load test (both lateral and vertical) in the initial stages of work using the same methodology and equipments which will be subsequently used for working piles. These tests shall be undertaken well in advance of taking up working piles. No working pile would be allowed to be undertaken till satisfactory initial pile load tests have been completed. Non- granting of permission for pile/ pile cap by Engineer in such respect will not be considered as reason for delay or any claim thereof. The test arrangement to be employed shall be of nature which is quick to install and remove and easily transferable. However, for stations initial load tests for all pile types have to be performed. Routine pile testing has to be as per IS 2911-Part 4
- viii The Contractor shall give the Engineer at least 48 hours' notice of the commencement of construction of these piles which are to be subjected to Initial Tests.
- ix The load tests shall not normally be conducted unless the concrete is at least 28 days old. However in special circumstances, permission can be given by Engineer for prior testing.
- x All testing shall be done under the direction of experienced personnel conversant with the equipment and the testing procedure.
- xi Before the commencement of the tests all the particulars regarding the test pile including boring data and concrete cube strengths shall be made available at site and shall form a part of the test report.
- xii On completion of each load test the Contractor shall submit a report of the load test which shall include the following information.
  - a. Description of soil conditions, ground water table, actual boring and installation records, concrete cube test results.
  - b. Method of load application
  - c. Load settlement readings during loading and unloading
  - d. Time load-settlement curve
  - e. All other observation relevant to the test being conducted.

**8.13 Integrity test**

Two types of pile integrity tests will be performed:

a. **Dynamic Integrity Test:**

The Dynamic Integrity test using pile driving analyser or approved equivalent for pile integrity shall be performed on all the piles as specified below. The top of the pile shall be made accessible, chipped off up to hard concrete, levelled by trimming it back as far as practicable. The reinforcing bars of the piles tested shall be bent sideways. The test shall be performed after removal of bad/ weak concrete at top so that the wave propagation is steady through hard concrete. The test shall be carried out at minimum 3 locations on each pile in such a way that the entire cross section of the pile is evenly covered. The test shall be conducted with a minimum age of concrete of 15 days. A specialist approved agency shall be employed for the test and the tests shall generally be as per recommendations of the agency unless directed by the Engineer. A complete report indicating the graphical display of wave propagation under each hammer blow shall be submitted along with interpretation of results showing discontinuities, cross-sectional changes or material changes if any are to be co-related with Site data. 75% of total working piles shall be tested by dynamic integrity test.

b. **Cross hole Ultra-Sonic Integrity Test**

The bored piles shall be tested to determine integrity of the pile by the above method.

The tests shall be carried out with consented method and consented specialist firm. 25% of total working piles shall be tested for integrity by Cross hole ultra-sonic method.

c. **General**

- i. The integrity of each pile shall be examined prior to acceptance of the pile into the Permanent Works.
- ii. At least 30 days prior to the commencement of integrity test, the Contractor shall submit the testing method, equipment, and testing company (specialised firm) to the Employer's Representative for his consent.
- iii. The Contractor shall demonstrate how the results obtained from the tests are to be interpreted in order that irregularities can be identified.
- iv. The equipment of tests shall be certified with recent calibration/set up of the instrument and with curriculum vitae of those using the instrument and interpreting the result.

d. **Criteria for acceptance**

- i. Criteria for acceptance or non-acceptance of the piles shall be established before starting the test in agreement between the Employer's Representative and the Contractor, based on specifications and experience records from the equipment supplier and the specialized company performing the testing, and other available information.
- ii. In cases where there is doubt if the pile can be accepted based on the test results, an impartial expert appointed by the Employer's Representative shall decide.

e. **Installation of pipes for integrity testing Cross hole Ultra-sonic method**

- i. 4 nos. of 50 mm (OD) Mild Steel pipes shall be fastened to the inner side of the reinforcement cage of all piles with diameter 1200mm or below. Installation of these pipes shall be carried out for the entire

length of the pile. All the joints (if any) in the pipes shall be properly sealed by suitable means so as to make them water tight. The bottom and top of these pipes shall be plugged to prevent entry of mud, slush, polymer slurry, concrete etc.. Spacing of these pipes shall be at 90° in piles with diameter of 1200mm or below. For 1500 mm and 2000 mm diameter piles, 6 nos. of 50 mm (OD) pipes spaced at 60° shall be used.

- ii. The mild steel pipes shall be supported and braced securely so that they maintain their position during cage lowering and subsequent concreting operations.

iii.

**f. Testing**

- i. The Contractor shall carry out the tests by a specialized experienced agency consented by the Employer's Representative for all bored piles or as directed by the Employer's Representative.
- ii. Unless otherwise directed or consented by the Employer's representative, integrity tests shall not be carried out until 7 days or more have elapsed since pile casting. Testing shall be undertaken on pile heads before steel reinforcement for pile caps is placed.
- iii. Once the testing is completed, the pipes shall be filled with standard cement non-shrink mortar/grout before taking up the pile cap works.
- iv. The testing shall be carried out in the presence of the Employer's Representative.

**g. Reporting**

- i. The Contractor shall submit to the Employer's Representative the test results, associated interpretive report and certificate for each tested pile within 10 days of the completion of each test.
- ii. The interpretation of test results shall be carried out by competent specialist engineers.

**h. Anomalies**

- i. If any anomalies, which indicate unacceptable weaknesses in the concrete, are reported as a result of integrity testing, the Contractor shall perform core drilling for sampling and laboratory testing to prove whether the quality and bearing capacity of the concrete are adequate. The program for necessary core drilling and testing shall be consented by the Employer's Representative.
- ii. If such anomalies are shown to be detrimental to the performance of the pile, remedial measures shall be consented by the Employer's Representative and undertaken by the Contractor to rectify this.
- iii. No covering over of the piles shall occur until the Employer's Representative is satisfied with the results of the testing and any remedial works.

The contractor shall conduct trial probes and trial pits down to depths decided by the Engineer with the objective of locating underground utilities well in advance of the piling. The locations shall be decided by the Engineer after consultation with the contractor.

**8.14**

**Defective Piles:**

- i. The Engineer reserves the right to reject any pile which in his opinion has not been constructed in accordance with the specifications.

- ii. The Contractor will not be paid for rejected piles. The increase in cost of the pile caps, tie beams and other measures adopted for strengthening as a result of rejection of defective piles shall be borne by the Contractor.

#### 8.15 As-Built Drawings:

On completion of the work, the Contractor will submit a plan showing the exact location and length of each pile as constructed at site, as well as dates of concreting, cube test results etc. The original tracing of this drawing shall be submitted to the Engineer.

#### 8.16 Pile Data:

The contractor shall submit data in the following proforma for each pile indicating all technical details along with date and time of various operations in adequate permanent forms/copies for record.

##### Proforma:

- i) Reference No. Location (Co-ordinates) \_\_ area.
- ii) Sequence of installation of piles in group
- iii) Pile diameter & type
- iv) Working level (Platform level)
- v) Cut off level (COL)
- vi) Actual length below COL
- vii) Pile termination level
  - (a) Start of socket (Level)
  - (b) Termination of pile (Level):
- viii) Top of finished concrete level
- ix) Date and time of start and completion of boring
- x) Depth of ground water table in the vicinity.
- xi) Type of rock at pile tip
- xii) Method of boring operation
- xiii) Details of stabilizing material as used:
- xiv) (a) Unconfined Compression Strength (UCS) Value in rock (from the nearest bore hole): Core recovery (from the nearest bore hole):
  - (b) Rate of drilling in mm / hr:
    - (1) At start of socketing horizon
    - (2) At termination level
- xv) Date and time of start and completion of concreting.
- xvi) Concrete quantity
  - Actual:
  - Theoretical:
- xvii) Grade and slump of concrete
- xviii) Results of test cubes

#### 8.17 Measurement for Payment (Not applicable for Schedule B):

The Contractor shall be paid for the length of each pile as measured from the theoretical founding level (as per drawing) or as per actual whichever is less to the point of the vertical cut-off level. The Contractor's rate shall include all items of work including all temporary/permanent arrangements for boring including usage of polymer slurry, concreting, handling, form-work, including chipping of top weak concrete, cutting off the MS liner / casing as necessary, removal of excavated earth, chipped concrete, casing / liners and polymer slurry away from site including its



treatment & final disposal, and all other items of work for the satisfactory completion of the pile foundations. Reinforcement shall be measured and paid separately. The quantity of permanent steel liners required for the job shall be measured in Metric tonnes and paid for separately as per the relevant item of BOQ. The boring/drilling and socketing through hard rock strata shall be measured extra over and paid for separately as per the relevant item of BOQ.

**S.09: SHALLOW FOUNDATIONS****9.1. General**

The work shall cover furnishing and providing plain or reinforced concrete foundation placed in open excavation, in accordance with the drawings and these Specifications or as directed by the Engineer.

Shallow foundations shall be used where a suitable bearing stratum is found near the surface without any highly compressible layers below and calculated settlements are within acceptable limits.

A method statement indicating the following shall be submitted by the Contractor for approval of the Engineer, well in advance of the commencement of construction of open foundation:

- i) Sources of materials
- ii) Design, erection and removal of formwork
- iii) Production, transportation, laying and curing of concrete
- iv) Personnel employed for execution and supervision
- v) Tests and sampling procedures
- vi) Equipment details
- vii) Quality Management System to be adopted including Quality Manual
- viii) Any other relevant information

Details of necessary arrangements for execution under water wherever necessary, shall be included in the method statement.

Dimensions, lines and levels shall be set out and checked with respect to permanent reference lines and permanent benchmark so that the foundations are located correctly and in accordance with the drawings.

Formwork, steel reinforcement and structural concrete for open foundations shall conform to S.02, S.05 and S.03 of Section-VII-F respectively of these Specifications.

**9.2. Workmanship****Preparation of Foundations**

Excavation for laying the foundation shall be carried out in accordance with S.02 of Section-VII-F of these Specifications. The last 300 mm of excavation shall be done just before laying of lean concrete below foundation. Excavation shall be made only to the exact depth as shown on the drawing or as approved by the Engineer.

Open foundations shall be constructed in dry conditions and the Contractor shall provide for adequate dewatering arrangements, wherever required, to the satisfaction of the Engineer.

Open foundations should be located on the firm ground having stable strata of having SBC as per drawing or as specified by the Engineer. The strata shall be well compacted before levelling course and foundations are laid on the levelling. In case foundations resting on rock, no foundation shall be laid on sloping rock. The rock shall be made level for the width of the foundation before levelling course is laid. Before seating on the rock, bearing capacity of the rock shall be assessed properly, and safe bearing capacity assessed in the designs is to be confirmed.

In case of Open foundation resting on rock, seating of the rock shall be achieved by providing adequate no. of anchorage bars drilled to the required depth in the rock or as directed by Engineer-In-Charge. Cost of the same is deemed to be included in the contract price and nothing extra shall be payable to the contractor in this regard.

**Setting Out**

The plan dimensions of the foundation shall be set out at the bottom of foundation trench and checked with respect to original reference line and axis.

**9.3. Construction**

- i. For foundation resting on soil, a layer of M15 concrete of minimum thickness 100 mm shall be provided above the natural ground to provide an even surface to support the foundation concrete. Before laying of lean concrete layer, the earth surface shall be cleaned of all loose material and wetted. Care shall be taken to avoid muddy surface. If any part of the surface has become muddy due to over-wetting, the same shall be removed. If required, the M15 concrete may be laid to a thickness of more than 100 mm, as per the direction of the Engineer. For foundations resting on rock, the rock surface shall be cleaned of any loose material and then levelled with a layer of concrete of the same grade as that of the foundation, so as to provide an even surface.
- ii. No point of the surface of the lean concrete, in the case of foundation on soil or the surface of hard rock, in the case of foundation on hard rock, shall be higher than the founding level shown on the drawing or as ordered by the Engineer. Levels of the surface shall be taken at intervals of not more than 3 meters centre-to-centre in each direction, subject to a minimum of nine levels on the surface.
- iii. Foundation Concreting to be done as per specified in the S.03 of Section-VII-F of these specifications. The concrete surface shall be finished smooth with a trowel.
- iv. Open foundations shall be laid dry. Where dewatering is necessary for laying of concrete, it shall be carried out adopting any one of the following methods or any other method, approved by the Engineer.
- v. All spaces excavated and not occupied by the foundations or other permanent works shall be refilled with sand or approved suitable material up to surface. Surrounding ground with sufficient allowance for settlement. All backfill shall be thoroughly compacted and in general, its top surface shall be neatly graded. Backfilling shall be in accordance with S.02 of Section-VII-F of these Specifications.

#### 9.4. Tests and Standards of Acceptance

The materials shall be tested in accordance with these Specifications and shall meet prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

Test Bore shall be done at each Pier Location, or as approved by the Engineer-In-Charge, as per IS 1892 for determining strata of the sub-soil for Open Foundation. Standard Penetration Test (SPT), as per IS 2131, in a bore hole shall be conducted at 1.0 m intervals in the overburden soil and rock portion having core recovery  $\leq 30\%$ .

Contractor shall conform bearing capacity and settlement for shallow foundation at each foundation location via SPT/Plate Load Test. Contractor shall conduct at-least one Plate Load Test for each type of shallow Foundation. Nothing extra shall be payable to the contractor on this regard.

#### 9.5. Tolerances

- |   |                |
|---|----------------|
| a) Variation in dimensions                            | : +50mm, -10mm |
| b) Misplacement from specified position in plan       | : 15mm         |
| c) Surface unevenness measured with 3 m straight edge | : 5mm          |
| d) Variation of levels at the top                     | : $\pm 25$ mm  |

#### 9.6. Measurement (applicable to the BOQ schedules)

Excavation in foundation shall not be payable, rates of the same is deemed to be included in the rate of Concrete works.

Lean concrete shall be measured in cubic metres in accordance with S.03 of Section-VII-F of these Specifications, based on the as shown on the drawing.

Concrete in foundation shall be measured in cubic metres in accordance with S.03 of Section-VII-F of these Specifications, based on the as shown on the drawing.

Reinforcement steel shall be measured in tonnes in accordance with S.05 of Section-VII-F of these Specifications, based on the as shown on the drawing.

The contract unit rates for excavation in foundation, lean concrete, including dewatering and blasting where required, concrete in foundation and reinforcement steel shall include all works as given in respective Sections of these Specifications and cover all incidental items for furnishing and providing open foundation as mentioned in this Section and as show on the drawings.

**S.10: MISCELLANEOUS****10 BEARINGS, SHEAR KEY DEVICES, EXPANSION JOINTS.****10.1 BEARINGS, SHEAR & EXPANSION JOINTS****i. GENERAL**

This work shall consist of design, supply and fixing in position of bearings for bridge girders in accordance with details shown in drawings and to the requirements of these specifications, codes and standards quoted therein and as directed by Engineer.

Expansion or fixed devices shall be constructed in accordance with details shown on drawings.

It shall be ensured that the bearings are set truly in level and in exact position as indicated on drawings so as to have full and even bearing on the seats. This shall be checked with spirit level in both directions. Thin epoxy mortar pads may be made to meet with this requirement.

It shall be ensured that the bottoms of girders that form a receiving surface for the bearings are plane at the location of these bearings and care shall be taken that the bearings are not displaced while placing the girders.

When elastomeric bearing pads are to be provided, the concrete surfaces on which pads are to be placed shall be wood float finished to a level plane, which shall not vary by more than 1.5 mm from a straight edge placed in any direction across the area by maintaining sufficient roughness .

**ii. POT-PTFE BEARING****a General**

- i. The design, drawings and detailed method statements for installation and replaceability of the bearings shall be got checked and certified by approved independent agency before submitting to the Engineer for approval.
- ii. Criteria for Selection of bearing manufacturer shall conform to the RDSO's list of approved manufacturers for Pot-PTFE bearings.
- iii. Pot bearings shall be measured in numbers Fixed Pot Bearing, Longitudinal guide pot bearing, transverse guide bearing & free pot bearing shall be counted separately, according to their capacities. The rate shall include the cost of supplying and fixing the bearing in position. The cost shall also include the cost of samples and their testing as required and conforming to specification.
- iv. The contractor shall furnish along with tender documents in technical bid, the name of the manufacturer of bearings, his qualifications with all details including proof of satisfactory performance, certification and testing facilities of the bearing he proposes to use

**b Material specifications of Pot bearing**

- i. All the materials to be used in POT Bearings shall confirm to clause No. 4 Materials of IRC 83: Part-III 2018.
- ii. Chloroprene (CR) only shall be used as raw polymer in the manufacture of Confined elastomer for the components of Pot Bearings.
- iii. The Pot Base, saddle, Piston & top plate shall be of cast steel only of Grade 340-570W of IS 1030 or equivalent, confirming to clause No. 4.1.2 of IRC 83: Part-III 2018.
- iv. The steel piston and the steel pot shall each be machined from a solid piece of cast steel.
- v. Guides shall be monolithic to the component to which it is connected.
- vi. Anchor sleeve.

All the part of bearing such as anchor sleeves embedded in concrete shall be hot dip galvanized @ 300gm/ Sqm. The anchor sleeves have to be designed taking account of difference in elasticity of steel of sleeve and concrete. The effect of shifting of center of rotation of sleeve should be also taken into account.

**c DESIGN**

Design of the bearing and all accessories shall be the responsibility of the Contractor and got approved from the Employer's Representative.

Design of the POT Bearings shall confirm to clause no. 5, Design Section of IRC:83(Part III)-2018.

The design, drawings and detailed method statements for installation and replaceability of the bearings shall be checked and certified by approved independent agency before submitting to the Engineer for approval.

**d Permissible stresses in steel component of Pot bearing**

All the design requirements for Pot bearing as specified in IRC: 83 Part-III has to be fulfilled with following modifications.

No increase in permissible stresses in any material of bearing or bearing stress between concrete and bearing is permitted in seismic condition.

Permissible bearing stresses in concrete

The allowable bearing stresses in concrete as defined in IRC: 83 Part-III has to be followed with following modifications.

**e Warranty of POT-PTFE Bearings.**

All bearings shall carry a warrantee of not less than 15 years in a format as approved by the Employer. The contractor shall be responsible for immediate repair or replacement of the bearings in case of failure / distress to the satisfaction of the Employer at no extra cost to the Employer within the warrantee period.

The following undertaking shall also be taken by the contractor from Manufacturer of Pot-PTFE Bearing for submission to the Employer:

- i. "We undertake to use -----(Name of Chloroprene) in the manufacturing of the Elastomeric bearings and the same shall be imported by us directly from ----- (name of Manufacturer)/purchased from ----- (Name of Agent) who is the authorized Indian agent of M/s----(Name of the Manufacture)."
- ii. "We hereby guarantee against defective materials manufactured workmanship as well as certify quality assurance at every step of manufacturing of bearings. Pot-PTFE bearings that may be supplied by us as per this office and which shall be installed at the ----- (Name of the Bridge) shall have life of 15 years under normal loading, normal traffic and routine maintenance. We also stand guarantee for free repair and replacement (including the cost of placing the new bearings in position) in part or full, if any, defect is found, in the bearings or part thereof within the period 36 months from the date of supply or 24 months from the date of installation whichever is earlier, except for defects arising out of theft pilferage, floods, earthquake or any other natural calamity etc, over which we have no control, shall be replaced free of cost."
- iii. "We also give an undertaking that the entire manufacturing and testing process shall be open to inspection for the client or their authorized representatives and that all possible help shall be extended in conducting the relevant tests required as per IRC 83 (Part-II) 2018 and other instructions issued by Ministry of Road Transport& Highways from time to time."

**f MANUFACTURING AND TOLERANCES:**

- i. The Contractor shall submit the Design & Fabrication drawings for the approval of Engineer at least 30 days prior to the start of bearing fabrication.
- ii. Manufacturing of Bearing shall be commenced only after the approval of Design and Fabrication drawings by the Engineer.
- iii. The bearings shall be manufactured in accordance with the clause 6.2 of IRC:83-2018 (Part-III) with the tolerances as specified in Clause 6.1 of IRC:83-2018 (Part-III).
- iv. For the measurements to be taken using dial height gauges, vernier calliper, surface finish measurement instrument etc., the measuring instruments shall be arranged by manufacturer at the workshop.
- v. Appropriate silicon grease shall be applied at the sliding material – stainless steel interface of bearing.
- vi. Movement indicators shall be provided for bearing with sliding assembly to facilitate routine inspection during service period.

**g PAINTING/CORROSION PROTECTION:**

All non-working exposed surfaces, including 50 mm (min.) return on surfaces to be in contact with concrete / steel shall be treated with full corrosion protection system conforming to the requirements of Clause 6.3.1 of IRC:83-2018 (Part-III).

**h SHOP DRAWINGS**

The Shop drawings to be submitted for Engineer's approval should contain the following necessary information, but not limited to:

- i. Quantity, type (fixed, guided expansion, non-guided expansion), and location of all bearing units.
- ii. A table containing maximum and minimum vertical and horizontal loads, design rotation requirements, and magnitudes and directions of movements.
- iii. Allowable contact stresses, maximum dimensions, and anchorage requirements at the bearing interfaces; grades, bevels, and slopes at all bearings; and allowable coefficients or friction of all sliding surfaces.
- iv. Any special consideration such as earthquake requirements, uplift details, or temporary attachments.
- v. Installation scheme of pot bearing.

**i INSPECTION AND ACCEPTANCE SPECIFICATION:**

- i. Bearings shall be manufactured to high standards both in terms of material quality and workmanship. The manufacturer shall have requisite load test and NDT facilities required for process and acceptance control tests installed at his plant. The test facilities and their operation shall be open for inspection. For confirmatory tests on raw materials, tests shall be conducted at in-house facility of the manufacturer or at NABL accredited laboratory.
- ii. All tests on raw materials and finished bearings shall be carried out as per procedures described in this section. All the test reports duly certified by the Engineer shall be furnished by the manufacturer at the time of despatch of the bearing.
- iii. Acceptance testing shall commence with the prior submittal of testing program in form of Inspection and Test Plan (ITP) prepared by the manufacturer and approved by concerned authority, to the Engineer.
- iv. Lot by lot inspection, testing and acceptance shall be made in accordance with the clause 7 of IRC:83-2018 (Part-III).

**j STORAGE, TRANSPORTATION AND HANDLING:**

- i. Bearings should be transported to bridge site after final acceptance by the Engineer/inspection agency appointed by the concerned authority and shall be accompanied by an-authenticated copy of the certificate to that effect.
- ii. All bearings shall have suitable index markings made of indelible ink or flexible paint, Which if practicable shall be visible after installation, identifying the information like Name of manufacturer, Month and year of manufacture, Bearing designation, Type of bearing, Load and movement capacity, Centreline markings to facilitate installation, Direction of major and minor movement, if any, Pre-set, if any.
- iii. Movement indicators shall be provided for bearing with sliding assembly to
- iv. facilitate routine inspection during service period.
- v. After assembly bearing components shall be held together with steel strapping, or other means, to prevent disassembly until the time of installation.
- vi. Packaging shall be adequate to prevent damage from impact as well as from dust and moisture contamination during transportation and storage.
- vii. "Provision against contamination of the sliding surface shall be made by suitable devices. Such protection devices shall be easily removable for the purpose of inspection". This may be achieved by the provision of a simple removable rubber apron around the bearing. This apron is connected by a Velcro-type fastener, allowing it to be easily removed without tools for inspections etc.

**k Installation of POT Bearing: -**

A detailed method statement shall be submitted considering the points mentioned below for the approval of Engineer. Installation work of POT Bearings shall be commenced only after approval of method statement by the Engineer.

- i. Bearings should be installed with care to ensure their correct functioning in accordance with the design for the whole structure. Bearings shall be so located as to avoid accumulation of dirt and debris likely to interfere with their performance and the structure so detailed that water is prevented from reaching the bearings. Proper installation of bearing is of utmost importance to ensure proper functioning of bearing and its durability. Poor installation may not only damage a high quality bearing but also may cause damage, instability and collapse of structures.
- ii. In order that moving surfaces are not contaminated, bearings should not normally be dismantled after leaving the manufacture's workshop but if for any reason they are, then this should only be done after Engineer's approval and under expert supervision and the manufacturer's assistance should be sought.
- iii. Transfer of superstructure weight on to bearings should not be allowed until sufficient strength has developed in the bedding material to resist the applied load. Temporary clamping devices should be removed at an appropriate time before the bearings are required to accommodate movement. Consideration should be given to any treatment required to holes exposed on the removal of temporary transit clamps. Where reuse of these fixing holes may be required, the material selected to fill them should not only give protection against deterioration but also should be easily removable without damaging the threads.
- iv. Correct location and orientation of the bearing with respect to the structures is of immense importance Mixing up in location or orientation may cause severe structural instability during construction and service.
- v.

**l Bedding**

- i. Bearing shall not be placed directly on matured concrete surface without use of appropriate bedding material.
- ii. The choice of bedding materials is influenced by the method of installation of the bearings, the size of the gap to be filled, the strength required and the required setting time. When selecting the bedding material, consideration should therefore be given to various factors like type of bearing, size of bearing, loading on bearing,



construction sequence and timing, early loading, friction requirements, access around the bearing, thickness of material required, design and condition of surface in the bearing area, shrinkage of the bedding material etc. as appropriate.

- iii. The thickness of the bedding material should be made as less as possible maintaining the requirement of workability and strength.
- iv. It is essential that the composition and workability of the bedding material be specified with the above factors in mind. In some cases it may be necessary to carry out trials to ascertain the most suitable material.
- v. Bedding Material shall be High Strength Non Shrink Epoxy Grout. Cost of this Grout material is included in the scope of work and nothing Extra is payable in this regard.
- vi. Bedding Material shall be got approved by Engineer before commencement of Work.
- vii. To ensure even loading on bearings and the supporting structures, it is essential that any bedding material whether above and below the bearing, extend over the whole area of the bearing. Improper application of bedding material, below and above the bearing, i.e. voids, gaps, impurity etc. may attribute to failure of the bearing irrespective of the quality of the product.

Bearings shall be bedded over their whole area. After installation there shall be no voids or hard spots. The bedding material shall be capable of transmitting the applied load to the structure without damage. Surfaces to receive bedding mortar shall be suitably prepared to a state compatible with the mortar chosen. The top surface of any extension of the bedding beyond the bearing shall have a downward slope away from the bearing.

**m Fixing of Bearing :-**

- i. To cater for vibration and accidental impact, some anchorage should be provided. Anchorage should be accurately set into recesses cast into the structure using templates and the remaining voids in the recesses should be filled with material capable of withstanding the loads involved i.e High Strength Epoxy Grout.
- ii. Bearings that are to be installed on temporary supports should be firmly fixed to the substructure by anchorage or other means to prevent disturbance during subsequent operations. Finally voids beneath the bearings should be completely filled with bedding material using the appropriate method.
- iii. Bearings may be fixed directly to metal bedding plates that may be cast in or bedded on top of the supporting structure or bottom of superstructure to the correct level and location. Generally recess are provided in the substructure for the anchorages.
- iv. If the structure is of steel, the bearings may be bolted or welded directly to it. Proper care shall be taken to ensure that there are no mismatch in the bolt holes of the structure and the bearing. In case of welding care should be taken to assess and avoid damage of bearing or its components due to heat or distortion.

Threaded fasteners shall be tightened uniformly to avoid overstressing of any part of the bearing.

- v. For bearings supporting precast concrete elements a thin layer of synthetic resin High Strength Non -shrinkage Epoxy mortar should be used between bearings and precast concrete beams. Bearings shall be bolted to anchor plates or metal bedding plates embedded in precast elements.
- vi. For bearing supporting steel elements a machined sole plate shall be used to ensure proper contact.

**n Installation Tolerance**

- i. The tolerances given below shall be strictly adhered to unless otherwise specified.

- ii. Bearings shall be located so that their centrelines are within  $\pm 3$  mm of their correct position.
- iii. The level of a bearing or the mean levels of more than one bearing at any support shall be within a tolerance of  $\pm 0.0001$  times the sum of the adjacent spans of a continuous girder but not exceeding  $\pm 5$  mm.
- iv. Bearings shall be placed in a horizontal plane within a tolerance of 1 in 200 in any direction unless otherwise specified, even under superstructure in gradient.

**o ELASTOMERIC BEARINGS**

The terms "bearing" in this case refers to an elastomeric bearing consisting of one or more internal layers of elastomer bonded to internal steel laminates by the process of vulcanization. The bearing shall cater for translation and/or rotation of the superstructure by elastic deformation.

**i. Raw Material**

- a. Chloroprene (CR) only shall be used as raw polymer in the manufacture of Elastomeric Bearing. Blending with up to 5% of another polymer, which may be added to aid processing, is permitted.
- b. For Chloroprene Rubber Compound, grades of raw elastomer of proven use in elastomeric bearings, with low crystallization rates and adequate shelf life (e.g. Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V) shall be used.
- c. No reclaimed rubber or vulcanized wastes or natural rubber shall be used. The raw elastomer /polymer content of the bearing shall not be lower than 50 per cent by its weight. The ash content shall not exceed 5 percent ( Polymer content shall be determined in accordance with ASTM D- 297, subsection 10 and ash content as per IS 3400 Part-XXII).
- d. EPDM and other similar candidate elastomer for bridge bearing use shall not be permitted.
- e. Tests for polymer identification through Pyrolysis test and confirmation about percentage of polymer content shall be carried out as per IS: 3400 (Part XXII).

**ii. Properties**

- a. The elastomer(CR) shall conform to the properties specified in Clause 4.2.1 of the IRC:83-2018 (Part-II). .
- b. The adhesion strength of elastomer to steel plate, determined according to IS: 3400 Part XIV method A, shall not be lesser than 7kN/m.
- c. Ozone resistance test shall be conducted in all cases of use of elastomeric bearings.
- d. Laminates of mild steel conforming to IS: 2062/ IS: 1079 or equivalent international grade shall be used. The yield stress of the material shall not be lesser than 250 MPa. Uses of any other materials like fibreglass or similar fabric as laminates are not permitted.

**iii. Manufacturing and Tolerances**

The Contractor shall submit the Design & Fabrication drawings for the approval of Engineer. Manufacturing of Bearing shall be commenced only after the approval of Design and Fabrication drawings by the Engineer. The bearings shall be manufactured in accordance with the clause 6 of IRC:83-2018 (Part-II) with the tolerances as specified in Table 5 of IRC:83-2018 (Part-II).

**iv. Acceptance Specifications**

- a. The manufacturer shall have all test facilities required for process and acceptance control tests installed at his plant to the complete satisfaction of the engineer. The test facilities and their operation shall be open to inspection by the engineer on demand.

- b. All acceptance and process control tests shall be conducted at the manufacturer's plant. Cost of all materials, equipment and labour shall be borne by the Contractor.
  - c. Acceptance testing shall be commenced with the prior submittal of testing programme by the Contractor to the engineer and after obtaining his approval.
  - d. All acceptance testing shall be conducted by the Engineer with aid of the personnel having adequate expertise and experience in rubber testing provided by the Contractor, working under the supervision of Engineer and to his complete satisfaction.
  - e. Lot by lot inspection, testing and acceptance shall be made in accordance with the clause 7 of IRC:83-2018 (Part-II).
  - f. A lot under acceptance shall comprise of all bearings, including the extra test bearings of equal size produced under identical conditions of manufacture to be supplied by the contractor. The level of acceptance testing shall be 'Level 1' as per the clause 7.8 of IRC:83-2018 (Part-II). The cost of extra test bearings shall be borne by the contractor irrespective of the Lot size.
  - g. Bearings tested at ULS condition, i.e. destructive testing, cannot be used in the structure since its performance at SLS cannot be guaranteed after such treatment.
  - h. If any further testing of materials is required by Engineer, such as polymer identification, Accelerated Ageing, Ozone Resistance etc., in accordance with the clause 7.9 of IRC:83-2018 (Part-II) , it shall be arranged for by the contractor at NABL accredited laboratory as approved by Engineer. For this, nothing extra shall be payable to the contractor.
  - i. In addition to tests mentioned above, all bearings shall be also weighed actually and compared with the theoretical weight.
  - j. Criteria for Selection of bearing manufacturer shall conform to the RDSO's list of approved manufacturers for Elastomeric bearings.
- v. Warranty of Elastomeric bearings.**
- All bearings shall carry a warranty of not less than 15 years in a format as approved by the Employer. The contractor shall be responsible for immediate repair or replacement of the bearings in case of failure / distress to the satisfaction of the Employer at no extra cost to the Employer within the warranted period.
- The following undertaking shall be taken by the contractor from the Manufacturer of Elastomeric Bearing for submission to the Employer:
- a. "We undertake to use -----(Name of Chloroprene) in the manufacturing of the Elastomeric bearings and the same shall be imported by us directly from ----- (name of Manufacturer)/purchased from ----- (Name of Agent) who is the authorized Indian agent of M/s----(Name of the Manufacture)."
  - b. "We hereby guarantee against defective materials manufactured workmanship as well as certify quality assurance at every step of manufacturing of bearings. Elastomeric bearings that may be supplied by us as per this office and which shall be installed at the -----(Name of the Bridge) shall have life of 15 years under normal loading, normal traffic and routine maintenance. We also stand guarantee for free repair and replacement (including the cost of placing the new bearings in position) in part or full, if any, defect is found, in the bearings or part thereof within the period 36 months from the date of supply or 24 months from the date of installation whichever is earlier, except for defects arising out of theft pilferage, floods, earthquake or any other natural calamity etc, over which we have no control, shall be replaced free of cost."

- c. "We also give an undertaking that the entire manufacturing and testing process shall be open to inspection for the client or their authorized representatives and that all possible help shall be extended in conducting the relevant tests required as per IRC 83 (Part-II) 2018 and other instructions issued by Ministry of Road Transport & Highways from time to time."

**vi. Design**

The design of elastomeric bearings shall conform to the provisions of the DBR of Maha-Metro and Design criteria specified in the Employer's requirement of the tender document.

The design, drawings and detailed method statements for installation and replaceability of the bearings shall be checked and certified by approved independent agency before submitting to the Engineer for approval.

**vii. Storage, Transportation and Handling**

Each bearing shall be uniquely and individually numbered for identification on its external faces. The identification number shall be unique and such as to enable other bearings manufactured at the same time to be traced through the production control records should the need arise. Where practicable the identification number shall also be visible after installation of the bearing in the structure. The top of each bearing shall be clearly marked and the size and direction of preset, if any, and the direction of installation shall be indicated.

During transport and handling prior to and during installation, bearing shall be wrapped in a cover. They shall be packed in timber crates with suitable arrangement to prevent movement and to protect columns and edges. Care shall be taken to avoid mechanical damage, contamination with oil, grease and dirt, undue exposure to sunlight and weather to the bearings during transport and handling prior to and during installation.

**viii. Installation**

- i. Bearings should be installed with care to ensure their correct functioning in accordance with the design for the whole structure and shall be installed in the structure as specified or approved by the engineer to ensure that right bearing is being installed at the right location.
- ii. Transfer of superstructure weight on to bearings should not be allowed until sufficient strength has developed in the bedding to resist the applied load.
- iii. For precast concrete or steel superstructure elements, fixing of bearing to them may be done by application of epoxy resin adhesive to interface, after specified surface preparation. The specification for adhesive material, workmanship and control shall be approved by the engineer. Care shall be taken to guard against faulty application and consequent behaviour of the adhesive layer as a lubricant. The bonding by the adhesive shall be deemed effective only as a device for installation and shall not be deemed to secure bearing against displacement for purpose of design.
- iv. Bearings must be placed between true horizontal surfaces (maximum tolerance 0.2 per cent perpendicular to load) and at true plan position of their control lines marked on receiving surfaces (maximum tolerance  $\pm 3$  mm). Concrete surfaces shall be free from local irregularities (maximum tolerance  $\pm 1$  mm in height).
- v. After installation, bearing and their surrounding areas shall be left clean.
- vi. The contractor shall submit the detailed procedure for installation of bearing including the type of Non-shrink epoxy grout material to be used for filling the bottom gap of smaller depth (less than 10mm) of the bearing after approval of Engineer. Cost of Non-shrink epoxy grout below the bearing is included in the cost of bearing and nothing extra shall be payable on this account.

**p SHEAR KEY DEVICE****a. GENERAL DESCRIPTION OF THE SYSTEM****i. General**

The shear key is made of concrete cast in place in second pour before concrete decks are assembled.

The shear keys shall take all horizontal loads (longitudinal and transverse).

It is equipped with vertical bearings as per approved drawings.

**ii. Vertical/Lateral Elastomeric bearings system**

On the movable side of deck, one sliding elastomeric bearing shall be installed longitudinally on each side of the shear key.

On the fixed side of deck, one laminated elastomeric bearing shall be installed longitudinally on each side of the shear key. In addition, at the interface between the shear key, one laminated elastomeric bearing with adequate recesses to allow for replacement without taking out the high tensile bars shall be installed transversally.

These elastomeric bearings shall be made of polychloroprene, and manufactured according to Euronorm EN 1337-3 or equivalent.

All the Technical specifications mentioned for Horizontal Elastomeric bearings shall be valid for Vertical/lateral Elastomeric Bearings also except the following tests Shear Deformation and Shear Bond tests.

**iii. INSTALLATION PROCEDURE**

The installation procedure is proposed as follows. Alternate methods can be submitted by the contractor, subject to MAHA METRO approval.

1. Shear Key is poured before precast concrete deck segments are installed. The span must be assembled on higher level to avoid conflicts with already built concrete key.
2. Superstructure should have recess of 20mm for grouting by non-shrinkage grout at later stage
3. Erect the superstructure on temporary bearings/jacks with sliding surface at top at both ends
4. Provide some arrangement to prevent deck sliding (e.g. under seismic load).
5. Move the girder by nearly 20mm
6. At this stage vertical faced elastomeric pad is placed in position
7. Replace the temporary bearing with the permanent elastomeric bearing
8. Grout the gap between the girder (with hacked surface at grouting location) and the elastomeric bearing

Notes:

**iv. MAINTENANCE PROCEDURE**

The system shall be such that any device can be replaced without any destruction of concrete part of the structure.

The system shall be such that the maintenance procedures described below can be undertaken.

**a) Vertical/lateral elastomeric bearings**

For the lateral vertical bearings, a theoretical gap of 2mm shall be provided on each side of the shear key. If it is needed to change one or all of these lateral bearings, then, as the deck will not be in contact on each side at a time, the

lateral bearings on the non: compressed side are taken out first. First the sliding plate is taken out, then the elastomeric bearing. Then the deck may need to be translated laterally to take out the elastomeric bearings on the compressed side. For this, steel angles can be split in the concrete on each side of the elastomeric bearings to provide support for jacks or threaded bars. The needed force to distort the neoprene bearings supporting the deck will be calculated.

#### q HOLD-DOWN DEVICES

### 1 GENERAL DESCRIPTION OF THE SYSTEM

#### i. General

The holds down devices are designed to take the lifting loads between the pier caps and the girders that may occur mainly during earthquakes in curved sections. The system of hold down device must take relative horizontal movements between the pier and the girder without any significant tensile stresses in the bars due to these movements.

#### ii. Description of the proposed system

(a) Movable end of the deck On the movable end, the system shall be composed of the 3 following devices:

- 1- A lower high tensile bar embedded in the pier cap concrete.  
The bar is smooth and it is threaded only at its two ends. The bars are only threaded at their ends and they are smooth on the full length in order to increase the fatigue performances. The bar is equipped with a repartition plate and a nut.
- 2- A system of spherical articulation allowing the relative angular rotation between the lower and the upper bar. This device shall be composed with:
  - A washer with adequate thickness to permit a good setting of the articulation device. Between the washer and the concrete shall be installed an elastomeric membrane to provide the waterproofing of the device.
  - A lower nut with an internal threading to be assembled with the lower bar and an external threading to be assembled with the spherical room. -An articulation room equipped with a spherical contact surface.
  - A spherical nut in contact with the spherical surface of the articulation room.
  - A rubber protection skirt installed between the articulation room and the upper bar to avoid any dust in the upper opening of the articulation.
  - A rectangular repartition plate to take into account the oblong recess.
  - A protection cap that shall be equipped such as to avoid the rotation of the nut and to adjust precisely the gap between the nut and the repartition plate.
- 3- A high tensile upper bar installed in an oblong recess provided in the girder.  
As for the lower bar, the upper bar shall be smooth and threaded at the two ends. The threading shall be made by rolling method. The corrosion protection of the bar shall be done by a heat shrinkable sleeve. In order to ensure that the lower bar will never break because this lower bar will not be replaceable, the diameter of the lower bar shall be always greater than the upper bar diameter, so that the upper bar shall always break (fuse principle) before the lower bar.  
The upper threading shall be longer in order to take the variation of distance between the girder and the pier cap, and the variation of height of the lower part of the girder. It shall also take into account the construction tolerance. Important:

- a) The articulation system will be designed in order to permit a rotation of at least 8° in all the directions without any tensile stress in the bar.
- b) The articulation system will be designed in order to avoid any rotation of any component under the vibrations.
- c) Fixed end of the deck In that case, the articulation device can be simplified and replaced by a coupler having two different threading diameters. The other devices are the same as for the movable end.

Nevertheless, attention is brought to the fact that the design of the articulations and of the couplers shall be such that there is the possibility to replace a coupler by an articulation in case of non-verticality of the lower bar. Therefore the "fixed end" device may need to be replaced with the more complex "movable end" device if construction tolerances are not met.

## 2 MATERIALS CHARACTERISTICS

### i) High tensile bars

Quality of steel: the quality of the raw material steel shall be according to the DIN EN 10083- 1 or equivalent. The chemical composition shall be such as to guarantee the following mechanical characteristics: -Yield stress  $F_y > 1050$  MPa

- Tensile stress  $F_u > 1200$  MPa
- Elongation at breaking  $> 10\%$
- Resilience at 20°C  $> 50$  Joules;

The threading of the bars shall be made by rolling method (cold plastic deformation of the metal between two dies) in order to give a good resistance to the fatigue.

The threads shall have a rectangular profile H7 according to ISO 262 - NFE 03014 and 03053. The tolerance of the length of the bars is  $\pm 5$ mm Foreseen Diameters of bars :

The stress in the bar will not exceed  $0.85 F_u$ . The lower bar shall not reach the yield strength before upper bar is broken. The following upper/lower U.T.S bars are contemplated, but may be adjusted (+/-) during detailed design phase:

upper diameter (U.T.S)	lower diameter (U.T.S)
500kN	700kN

### ii) CORROSION PROTECTION D.3.1 High tensile bars

The protection against corrosion of the high tensile bars shall be performed by using a heat shrinkable sleeve in order to give a very good protection against corrosion due to humidity, ozone, UV rays and shocks.

### iii) other materials

The upper repartition plate and the protection cap shall be sandblasted and shall receive 3 layers of coating.

The articulation room, the Coupler and the lower ring shall be sandblasted and shall receive 3 layers of coating and a petrolatum tape.

The articulation room and the upper protection cap shall be filled up with grease.

### iv) TRANSPORTATION & STORAGE

The bars and the accessories shall be transported in wooden cases and in containers, or equivalent.

The bar threading shall be temporarily protected against shocks by a greased tape and a steel ring or equivalent. The protection of the threads shall be taken off only right before the installation of the bars.

The bars and accessories shall be carefully stored in the jobsite in the following conditions:

- They shall be protected from rain, and the storage room shall have ventilation.
- If the bars have to be kept stored for a long time, it will be necessary to protect them with a layer of solvable oil or equivalent in order to protect them against corrosion.
- Before installation of the bars, if there is some corrosion, they shall be cleaned up. Acceptance of the bars shall be subject to MAHA METRO approval.

**v) INSTALLATION PROCEDURE**

The installation procedure is proposed as follows. Alternate methods can be submitted by the contractor, subject to MAHA METRO approval.

**a) Installation of the lower bars**

- Place the bar with the repartition plate and the nut into the reinforcement of the pier cap.
- Check that the length out of the concrete pier cap concrete is sufficient to install the articulation or the coupler.
- Check that the bar is installed vertically.
- Pour the pier cap concrete.

**b) Installation of the articulation (or the coupler) and the upper bar**

- Install the lower washer and the elastomeric pad on a plane and horizontal layer of mortar.
- Install the lower ring with the external and internal threading around the lower bar.
- Bring the upper bar equipped with the articulation room and the spherical nut and put in position the nut and the upper bar; the length of the pins installed between the nut and the ring shall be such to avoid any gap between the lower nut and the spherical articulation.
- Screw the articulation room until it is in contact with the lower washer.
- Apply a closing tape or equivalent between the bar end and the spherical nut.
- Fill the upper hole of the articulation room with grease or equivalent.
- Install the upper repartition plate on a plane and horizontal mortar.
- Apply a dosing tape or equivalent between the end of the bar and the spherical nut.
- Install the upper spherical nut around the bar in order to be in contact with the spherical surface of the repartition plate. At this stage, there shall be no gap between the two spherical nuts, the articulation room and the repartition plate.

The installation of the protection cap will allow to give a 2mm gap necessary to let the system free of rotation when there is any horizontal movement.

- Install a tape around the articulation room and the lower ring.



- Install the rubber protection skirt between the articulation room and the upper bar (the rubber skirt shall be filled up with grease).

**NOTE:** the same procedure can be applied for the fixed end, where the articulation room is replaced by a coupler.

vi)

#### **MAINTENANCE PROCEDURE**

The system shall be such that the maintenance procedures described below can be undertaken.

##### **a. Periodical inspection**

- Every 5 years or after an earthquake, a visual inspection of the articulation room and the rubber protection skirt will have to be made to check the corrosion protection.
- At the same time, the upper protection cap will be taken off to check if the 2mm gap is still there and to adjust again this gap if necessary.
- The protection against corrosion of the upper bar will also be checked.

b.

##### **Maintenance**

The system does not need any maintenance if it works in normal conditions. Nevertheless, if there is an earthquake, a special inspection will be carried out. If it is necessary to change the upper bar. The articulation device or the coupler, it will be necessary to take off the upper bar first, and to change the damaged devices according to the installation procedure.

#### **r. EXPANSION JOINTS**

##### **a. Scope of Work**

The scope of work will include:

- Preparation of detailed engineering and installation drawings, supply and supervision during fixing of strip seal/compression seal/Omega type expansion joints conforming to specifications. The expected expansion/contraction of the superstructure at the location of expansion joints are shown in relevant drawings.
- Design, manufacture, providing and seating of expansion joints by the specialized agency and approved by the Engineer.
- Necessary technical supervision for installation of each and every expansion joint during different stages of installation including rectification of any deficiency or defect attributable to fixing and installation will be provided by the manufacturer/supplier.
- The expansion joint shall be provided for the full width of viaduct including the railing.
- Leak tightness of all joints shall be ensured which shall also carry a warranty of 10 years from the contractor.
- Criteria for Selection of Expansion Joint manufacturer shall conform to the RDSO's list of approved manufacturers for Elastomeric bearings. All bearings shall carry a warrantee of not less than 10 years in a format as approved by the Employer. The contractor shall be responsible for immediate repair or replacement of the Expansion joints in case of failure / distress to the satisfaction of the Employer at no extra cost to the Employer within the warrantee period.
- The expansion joints provided over elevated structure decks should be so designed as to be compatible with the bearings.
- The expansion joint system of Omega type/W-seal or equivalent shall comprised of EPDM flexible Seal and work on Arch Principals fixed by Epoxy adhesive, the seal must confirm to BS-4225 and epoxy adhesive

confirm to ASTM C—881 specification. The EPDM moisture barrier must be provided underneath of each joint fixing by binding wire with deck reinforcement. EPDM moisture barrier having predetermined holes and must be imported and confirm to ASTM 2240 & ASTM - G53 & 84 all complete as per manufacturer drawing.

- ix) The contractor shall submit design and drawing of expansion joints based on design criteria mentioned under "scope of Work" to the Engineer for approval. The design of expansion joint shall be done as per IS and International codes as applicable and Sound Engineering practices.
  - x) Any modification to the design and drawings submitted by the Contractor, if suggested by the Engineer, shall be incorporated without any reservations. The design and drawings including changes approved by the Engineer shall form basis of execution and that Contractor shall undertake all necessary action for ensuring execution of work on that basis. For design, manufacture, testing and supply of Omega type/ W-seal expansion joints, following will be followed in order of preferences.
    - (a) Details in this chapter and elsewhere in tender documents.
    - (b) IRC Codes and MORTH specifications for Roads and bridges published by Indian Road Congress.
    - (c) Sound Engineering Practice (Decision of Engineer will be final in this case) which shall include specialized literature as decided by Engineer-in-Charge.
- b. Building Expansion Joints:** Specialised expansion joints consisting of extruded aluminium frame assemblies of suitable profile to receive free floating cover plate of required shape and profile / or elastomer suited to building applications shall be used. These will be provided for covering the structural gap at expansion joints along the horizontal faces of slabs and beams, vertical faces of retaining walls, etc. Necessary block-outs as per the manufacturer's recommendations shall be provided in the structure which shall be filled in the approved manner after placing the expansion joints. The base of the expansion joint assembly shall be fixed onto the concrete base using anchor fasteners (not exposed to top surface) as per manufacturer's specifications. The joint shall have, and anti-skid serrated top plate with a free-floating central plate. All aluminium in contact with concrete shall have zinc chromate finish. The joint assembly shall be capable of accommodating the specified movement without loss of cover and shall include all the necessary accessories, sealant etc as per manufacturer's drawings. The joint fixing shall be carried out by the main contractor under the supervision of supplier/manufacturing agency of approved expansion joint. The expansion joint cover assemblies shall withstand a minimum 500lb point load without damage or permanent deformation. The joint should be watertight and test on same if required on direction of Engineer shall be conducted without any extra payment for same.
- c. SPECIFICATION FOR STRIP SEAL EXPANSION JOINT:**  
Expansion joint type described here-after is the "strip seal" type, but alternate designs can be proposed for concerned organization approval (e.g., elastomeric omega-shape cover joint, or any other suitable joint type)

**1) Components:**

Strip seal expansion joint shall comprise the following items:

i. Edge beam:

This shall be either extruded or hot rolled steel section or cold rolled cellular steel section with suitable profile to mechanically lock the sealing element in place throughout the normal movement cycle. Further the configuration shall be such that the section has a minimum thickness of 10mm all along its cross section (flanges and web). The minimum height of the edge beam section shall be 80mm. The minimum cross-sectional area of the edge beam shall be 1500mm<sup>2</sup>.

ii. Anchorage:

Edge beams shall be anchored to the deck by reinforcing bars or bolts or anchor plates cast in concrete or a combination of anchor plate and reinforcing bars. Anchor bars studs or bolts shall engage the main structural reinforcement of the deck and in case of anchor plates or loops, this shall be achieved by passing transverse bars through the loops or plates.

The minimum thickness of anchor plate shall be 12mm. Total cross sectional area of bar on each side of the joint shall not be less than 1600mm<sup>2</sup> per meter length of the joint and the centre to centre spacing shall not exceed 250mm. The ultimate resistance of anchorage shall not be less than 600 kN/m in any direction.

**2) Material**

- i. The steel for edge beams shall conform to any of the steel grade corresponding to RST 37-2 or 37-3 (DIN), ASTM A36 or A588, CAN/CSA Standard G40.21 Grade 300W or equivalent.
- ii. Anchorage steel shall conform to IS:2062 or equivalent.
- iii. All steel sections shall be protected against corrosion by hot dip galvanizing or any other approved anti corrosive coating with a minimum thickness of 100 micron.
- iv. Chloroprene of strip seal element shall conform to Clause 915.1 of IRC:83 (Part-II).

The properties of chloroprene shall be as specified in Table-1.

**3) Fabrication (Pre-installation)**

- i. The strip seal joint system and all its component parts including anchorages shall be supplied by the manufacturer /system supplier.

- ii. The width of the gap to cater for movement due to thermal effect, prestress, shrinkage and creep, superstructure deformations (if any) and sub-structure deformations (if any) shall be determined and intimated to the manufacturer. Depending upon the temperature at which the joint is to be installed, the gap dimension shall be preset.
- iii. Each strip seal expansion joint system shall be fabricated as a single entity unless stage construction or excessive length prohibits monolithic fabrication. It shall fit the full width of the structure as indicated on the approved drawing. The system shall be pre-set by the manufacturer prior to transportation. Pre-setting shall be done in accordance with the joint opening indicated on the drawing.
- iv. The finally assembled joint shall then be clamped and transported to the work site.

**TABLE-1 STRIP SEAL ELEMENT SPECIFICATION**

Sealing element is made of chloroprene and must be extruded section. The working movement range of the sealing element shall be at 70mm.

Property	Specified Value
Hardness*	63+ /-5 Shore A
DIN 53505	55 +/- 5 Shore A
ASTM D 2240 (Modified)	.
Tensile Strength*	Min 11 MPa
DIN 53504	Min 13 .8Mpa
ASTM D 412	
Elongation at fracture*	Min 350 per cent
DIN 53504	Min 250 per cent
ASTM D 412	
Tear Propagation Strength	Min 10 N/mm
Longitudinal	Min 10 N/mm
Transverse	Min 25 per cent
Shock elasticity	Min 220 Cu.mm
Abrasion	
Residual Compressive Strain (22h/70 deg C/30 per cent Strain))	Max 28 per cent
Aging in hot air (14days/70 deg C) Change in hardness	Max + 7 Shore A

Change in tensile strength	Max –20 per cent
Change in elongation at fracture	-20 per cent
Ageing in Ozone (24 h/50 pphm/25 deg C/20 per cent elongation)	No cracks
Swelling behaviour in Oil (168h/25 deg. C)	
ASTM Oil No. 1      Volume Change	Max + 5 per cent
Change in hardness	Max –10 Shore A
ASTM Oil No. 3	
Volume Change	Max + 25 per cent
Change in hardness	Max –20 Shore A
Cold Hardening Point	Max –35 deg C

Only one set of specification viz. ASTM or DIN shall be followed depending on the source of supply.

- v. Each strip seal expansion joint system shall be fabricated as a single entity unless stage construction or excessive length prohibits monolithic fabrication. It shall fit the full width of the structure as indicated on the approved drawing. The system shall be pre-set by the manufacturer prior to transportation. Presetting shall be done in accordance with the joint opening indicated on the drawing.
- vi. The finally assembled joint shall then be clamped and transported to the work site.

#### 4) Handling and Storage

- i. For transportation and storage, auxiliary brackets shall be provided to hold the joint assembly together.
- ii. The manufacturer/supplier shall supply either directly to the Engineer or to the Bridge Contractor all the materials of strip seal joints including sealants and all other accessories for the effective installation of the jointing.
- iii. Expansion joint material shall be handled with care. It shall be stored under cover on suitable lumber padding.

#### 5) Supply/Installation:

Components of expansion joint such as edge beam and strip seal shall be imported from the specified foreign manufacturer / collaborator to ensure quality and performance. The joint shall be supplied and installed only by the MOST approved manufacturer. Contractor shall furnish a warranty of trouble-free performance for at

least ten years and free rectification of defects / replacement, if any, during this period.

The joints shall be installed by the manufacturer/supplier (only MOST Approved) or their authorised representative who will ensure compliance to the manufacturer's instructions for installation.

Taking the width of gap for movement of the joint into account, the dimensions of the recess in the decking shall be established in accordance with the drawings or design data of the manufacturer. The surfaces of the recess shall be thoroughly cleaned, and all dirt and debris removed. The exposed reinforcement shall be suitably adjusted to permit unobstructed lowering of the joint into the recess.

The recess shall be shuttered in such a way that dimensions in the joint drawing are maintained. The formwork shall be rigid and firm.

Immediately prior to placing the joint, the pre-setting shall be inspected. Should the actual temperature of the structure be different from the temperature provided for pre-setting, correction of the pre-setting shall be done. After adjustment, the brackets shall be tightened again.

The joint shall be lowered in a pre-determined position. Following placement of the joint in the prepared recess, the joint shall be levelled and finally aligned and the anchorage steel on one side of the joint welded to the exposed reinforcement bars of the structure. Upon completion, the same procedure shall be followed for the other side of the joint. With the expansion joint finally held at both sides, the auxiliary brackets shall be released, allowing the joint to take up the movement of the structure.

High quality concrete shall then be filled into the recess. The packing concrete must feature low shrinkage and have the same strength as that of the superstructure, but in any case, not less than M40 grade. Good compaction and careful curing of concrete is particularly important. After the concrete has cured, the movable installation brackets and shuttering still in place shall be removed.

The neoprene seal shall be field installed in continuous length spanning the entire roadway width. To ensure proper fit of seal and enhance the ease of installation dirt, spatter or standing water shall be removed from the steel cavity using a brush, scrapper or compressed air. The seal shall be installed without any damage to the seal by suitable hand method or machine tools.

The deck surfacing shall be finished flush with the top of the steel sections. The horizontal leg of the edge beam shall be cleaned beforehand. It is particularly important to ensure thorough and careful compaction of the surfacing in order to prevent any premature depression forming in it.

**6) Acceptance Criteria:**

- i. All steel elements shall be finished with corrosion protection system.
- ii. For neoprene seal, the acceptance test shall conform to the requirements stipulated in Table-1. The manufacturer/supplier shall produce a test certificate, accordingly, conducted in a recognized laboratory, in India or abroad.
- iii. The manufacturer shall produce test certificates indicating that anchorage system had been tested in recognized laboratory to determine optimum configuration of anchorage assembly under dynamic loading.
- iv. Prior to acceptance 25 percent of the completed and installed joints, subject to a minimum of one joint, shall be subjected to water tightness test. Water shall be continuously ponded along the entire length for a minimum period of 4 hours for a depth of 25mm above the highest point of deck. The width of ponding shall be at least 50mm beyond the anchorage block of the joint on either side. The depth of water shall not fall below 25mm anytime during the test. A close inspection of the underside of the joint shall not reveal any leakage.
- v. As strip seal type of joint is specialized in nature, generally of the proprietary type, the manufacturer shall be required to produce evidence of satisfactory performance of this type of joint.

**7) Test and Standards of Acceptance:**

The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria. The manufacturer/supplier shall furnish the requisite certificates from the recognized testing laboratory of India or abroad.

**8) WATERBARS / WATERSTOPS**

Where waterbars are required, the joints shall incorporate PVC water bar such as "Fixostop" or approved equivalent (conforming to IS: 12200). The water bars shall be complete with all the necessary moulded or prefabricated intersection pieces assembled with bends and butt joints in running lengths made by welding in an electrically heated jig. The fabrication drawing made by the manufacturer shall be submitted by the Contractor for approval of the Engineer

Jointing and fixing of waterbars shall be carried out strictly in accordance with the manufacturer's instructions which should be enumerated in a detailed method statement and submitted for approval / comments of the Engineer-in-Charge. The following types of waterstops are proposed to be used in the Work.

- i. 'FIXOSTOP' Type 230 KD or equivalent – To be used at construction joint in baseslab
- ii. 'FIXOSTOP' Type 230 KV or equivalent – To be used at expansion joint in base slab
- iii. 'FIXOSTOP' Type 240 RS or equivalent – To be used at construction joint in between wall and base slab
- iv. 'FIXOSTOP' Type 240 H or equivalent – To be used at expansion joint in base slab

Waterbars shall be of approved and appropriate type obtained from approved manufacturers.

The waterbars shall be installed so that they are securely held in their correct position during the placing and compacting of the concrete. Necessary supporting devices to prevent sagging of the water bars shall be provided.

Where reinforcement is present adjacent to waterbars, adequate clearance shall be left between the reinforcement and waterbars to facilitate compaction of the concrete.

Double headed nails maybe used in the edge of the waterbar outside the line of the external grooves for fixing purposes, but no other holes shall be permitted through the waterbar.

A representative of the manufacturer shall be present at site during the operations of installing, jointing and embedment of waterstop. He shall monitor and certify that the work is being carried out strictly as per specifications and recommended practices.

**d. SPECIFICATION FOR OMEGA TYPE EXPANSION JOINT**

1. Expansion joint type described here-after is the "OMEGA TYPE EXPANSION JOINT".As per IRC 83 part II 2018

- i. Deleted.
- ii. Material.
- iii. Deleted.

**2. Anchorage:**

The steel plate shall conform to IS: 2062 or equivalent. The bolt and nut shall be anchored to the deck by welding to the main reinforcement Steel plate used for shall be 8 mm thick hot dip galvanized. The center-to-center spacing of bolts shall not exceed 400 mm.

**3. Corrosion Protection:**

All steel section shall be protected against corrosion by hot dip galvanizing or any other approved anti-corrosive coating with a minimum thickness of 100 micron.

**4. Joint Seal:**

G. 2.4.1 The sealing element shall be a preformed chloroprene with high tear strength. Insensitive to soil, gasoline and ozone. It shall have high



resistance to ageing and ensure water tightness. The seal should be vulcanized in a single operation for the full length of the joint. The seal shall cater for a horizontal movement up to 100mm and vertical movement of 3mm. G. 2.4.2 the physical properties of chloroprene sealing element shall conform to the following:

(a) Deleted.

(b) **Elastomeric seal**

It shall be performed extruded Omega type section of Elastomeric Seal of such a shape as to promote self-removal of foreign material during normal service operations. Elastomer of joint seal shall conform to clause 915.1 of IRC:83 (Part-II) and satisfy the properties stipulated in Table 2 strip seal element specifications of these specifications given in MORTH Circular no.RW/NH-34059/96-5 & R dated 30 Nov 02 on the subject except in respect of the working movement range of the sealing element which shall be as specified in CI G.2.4.1 above.

(c) Deleted.

**F.2.5. Deleted.**

**F.3. Handling and Storage:**

- (i) The expansion joint material shall be handled with care and stored under cover.
- (ii) All joint material and assemblies shall be protected from damage and assemblies shall be supported to maintain true shape and alignment during transportation and storage.

**F.4 . Installation:**

- i. The expansion joint shall be installed by the manufacturer/supplier or their authority's representative, who will ensure compliance of installation procedure and instructions.
- ii. The dimension of the joint recess edge beam above deck slab and the width of the gap shall conform to the approved drawing.
- iii. Bolts shall be welded to the main reinforcement in the edge beam deck maintaining the level and alignment of the joint.
- iv. Concreting of edge beam shall be done with great care using proper mix conforming to same grade as that of the deck concrete but no less than M30 grade in any case. The water cement ratio shall not be more than 0.40. If needed, suitable admixtures may be used to achieve the workability. Care shall also be taken to ensure efficient bonding between already cast/existing deck concrete and the concrete in the joint recess edge beam.
- v. At the time of installation, joint shall be clean and dry and free from spalls and irregularities, which might impair a proper joint seal.
- vi. Concrete or metal surfaces shall be clean, free of rust, laitance, oils, dirt, dust or other deleterious materials.
- vii. Deleted.
- viii. The joint seal shall be compressed to the specified thickness for the rated joint opening and ambient temperature at the time of installation, which shall be between +05 to +35 degree C.
- ix. The joint seal shall be installed without damage to the seal. Loose fitting or open joints shall not be permitted.

**F.5. Acceptance Criteria:**

F.5.1. All steel elements shall be furnished with corrosion protection system.

F.5.2. For the joint seal the acceptance test shall conform to the requirements stipulated in para G.2.4 above. The manufacturer/supplier of this type of joint shall produce a test certificate to this effect conducted in a recognized laboratory in India or abroad.

F.5.3. Prior to acceptance 25% of the completed and installed joints, subject to a minimum of one joint, shall be subjected to water tightness test. Water shall be continuously ponded along the entire length for a minimum period of 4 hours for a depth of 25mm above the highest point of deck. The width of ponding shall be at-least 50mm beyond the anchorage block of the joint on either side. The depth of water shall not fall below 25mm any time during the test. A close inspection of the underside of the joint shall not reveal any leakage.

#### **F.6. Tests and Standards of Acceptance:**

The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria. The manufacturer/supplier shall furnish the requisite from the recognized testing laboratory of India or abroad.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

#### **F.7. Rates:**

The contract unit rate shall include the cost of all materials, labour, equipment, cost of testing including cost of test samples and other incidental charges for fixing the joints complete in all respects as per specifications.

### **10.3 RAILINGS**

#### **10.3.1 General**

Prefabricated railing as per approved design and drawing shall be provided and erected at site. Fixing arrangements on segment parapet shall be carefully designed and incorporated.

Railing shall be carefully erected true to line and grade. Posts shall be vertical with a tolerance not exceeding 6 mm in 3 m. All edges and corners shall be straight and finished to true line and level.

Contractor should prepare and submit his own drawings and Method Statement as per best industrial practices for approval of Engineer before commencement of work. The work shall be commenced only after approval of the Method statement by Engineer.

#### **10.3.2 Metal Railings**

##### **10.3.2.1 General**

- i. MS Hand Railings shall be provided as per tender drawings attached.
- ii. All complete steel railing elements, terminal sections, posts, and other fittings shall be of shape, size and designation of approved material and make as given in the item of work or as directed by Engineer.
- iii. All these elements shall be painted with an approved paint. Primer coat (zinc epilux or equivalent) & three coats of PU paint as per specification and drawing. with all lead and lifts and as per the directions of engineer. If straightening is necessary, it shall be done by methods approved by Engineer.
- iv. The Contractor shall take every precaution against damage of the components during fixing in position.
- v. Damaged painted surfaces shall be cleaned and repainted. Special care shall be taken to prevent staining of all products, rust, mortar, etc. before it is put into use.
- vi. The Contractor shall take every precaution against damage of the components during fixing in position.

##### **10.3.2.2 Fixing**

- i. The railing shall be carefully adjusted prior to fixing in place to ensure proper matching at abutting joints, correct alignment and camber throughout their length. Fixing shall be strictly as per fixing details shown on approved drawing or as directed by engineer.

- ii. All necessary holes, anchor bolts etc., required in fixing shall be made by the contractor and made good after installation, without any extra charge
- iii. Any damages done to the parapet while installing MS Railing shall be rectified by the contractor at his own cost. As per method statement approved by Engineer Nothing extra is payable in this regard.
- iv. Maximum continuous length at topmost pipe shall be restricted to 15.5m.
- v. Where the span length is less than 31m, 50mm gap shall be provided between continuous railing at Mid span Location(L/2)
- vi. Where the span length is greater than 31m, 50mm gap shall be provided between continuous railing at Location(L/3).

## 10.4 DRAINAGE SPOUTS AND DRAINAGE PIPE

### 10.4.1 GENERAL

- i. This work shall consist of supply and fixing in position of drainage spouts and drainage pipes for bridge decks and piers true to lines, levels and position in accordance with details shown on drawings and to the requirements of these specifications and drainage plan for structure.
- ii. Where details are not given on drawings, contractor should prepare and submit his own drawings and Method Statement as per best industrial practices for approval of Engineer before commencement of work The work shall be commenced only after approval of the Method statement by Engineer.
- iii. Underground / Surface drainage works are to be designed by Contractor and carried as per CPWD specifications 2019 and paid for separately under DSR items.
- iv. Drainage pipe (Down take Pipe) to be embedded in pier and seismic Arrestor shall be of HDPE corrugated double wall and drainage pipe(Runner pipe) from Drainage spout outlet till Seismic Arrestor including bends shall be made of UPVC
- v. UPVC pipes shall be fixed to deck slab using adequate clamping, details of clamping shall be mentioned in the Method Statement and drawings submitted for approval of Engineer.
- vi. Minimum Working Pressure of UPVC pipes shall be 4Kg per Sq.cm and minimum diameter of UPVC Runner pipe shall be 160mm. Minimum diameter of HDPE down take pipe shall be 200mm.
- vii. UPVC pipes Specifications and fixing, including jointing of pipes using suitable approved solvents at connections. shall Conform to IS 4985 latest revision, Drainage spouts shall be as per MOST Type design No.SD/303. The waterspouts shall be provided at locations shown as per relevant layout drawing, and with a spacing not exceeding 5m.
- viii. Door bends i.e. (opening with a door/cap) shall be provided at all U-PVC pipe bend locations, to access and remove any debris choked at bend locations.
- ix. UPVC pipe shall be temporarily placed in the HDPE Pipe fixed in the pier during concreting and shall be moved up and down to avoid any ingress of slurry and avoid choking of HDPE Pipe due to damage of HDPE Pipe during needle vibrator compaction of pier concrete.

### DESIGN:

#### Drainage:

The drainage of deck shall be designed to cater the maximum envisaged rainfall intensity and suitable longitudinal and transverse slope should be provided. Moreover, the provisions of Clauses-10.4.1.1 & 15.2.2 of IRS-CBC shall be followed.

#### Solid Pier

The drainpipe of double wall HDPE corrugated pipes will be located within solid pier to avoid unpleasant aesthetics.

### 10.4.2 FABRICATION

- i. Drainage assembly including drainage-spouts, gully-gratings and clean-out fixtures, shall be fabricated to dimensions shown in the drawings, and adequately fixed to the deck.

- ii. All materials shall be corrosion resistant; steel components shall be of mild steel conforming to IS 2062. The drainage assembly shall be seam welded for water tightness and then hot dip galvanised @ 650g/m<sup>2</sup> and further painted with anti-corrosion powder coated paint.
- iii. Drainage outlets shall be so provided that the discharge of the rainwater drained by them is not directed towards any part of the superstructure or substructure component.

#### 10.4.3 PLACEMENT

The galvanised assembly of drainage spout shall be placed in true position, lines and level as shown in drawing with necessary cut-out in the shuttering for deck slab and held in position firmly. Where reinforcement of the deck is required to be cut, equivalent reinforcement shall be placed at the corners of the assembly.

#### 10.4.4 FINISHING

After setting of deck slab concrete, shrinkage cracks around the assembly shall be totally sealed with polysulphide sealant or bituminous sealant as per IS: 1834 and excess sealant trimmed.

#### 10.5 Manhole Cover

- A. The covers and frames shall conform to IS 1726 for cast Iron shall be of the following grades and types. Grade of Manhole Cover shall be either Medium, MD - 10 Rectangular/Circular or as decided by Engineer.
- B. The size of man hole cover shall be minimum of 900mm.
- C. The following specifications for Cast Iron Manhole Covers and Frames shall be followed:-
  - (i) Manhole covers and frame shall be manufactured from appropriate grade of grey cast iron not inferior than FG150 grade of IS 210.
  - (ii) They shall be cleanly cast and shall be free from air and sand holes, cold shuts and warping.
  - (iii) Covers shall have on its operative top a raised chequered design to provide for an adequate no-slip grip. The rise of chequers shall be not less than 4mm.
  - (iv) Key holes, keys and lifting devices shall be provided in the manhole covered to facilitate their placement in the frames and their operative maintenance.
  - (v) Manhole covers and frames shall be coated with materials having base with a black bituminous composition. The coating shall be smooth and tenacious. It shall not flow when exposed to temperature of 63°C and shall not be so brittle as to chip off at temperature of 0°C.
  - (vi) Size and shape and performance requirement of manhole covers, and frames shall conform to IS 1726.
  - (vii) Each manhole covers and frame shall have cast on them the following information:
    - (a) Manufacturer's name or trademark
    - (b) Grade designation
    - (c) Date of manufacturer
    - (d) The words SWD or 'Sewer' to denote 'storm water drain' or 'sewer' respectively
    - (e) Identification marks as required by Engineer-in-Charge.
  - (viii) The cover shall be gas tight and watertight.
  - (ix) The sizes of covers specified shall be taken as the clear internal dimensions of the frame.
  - (x) The approximate weight of the various type of manhole covers and frames shall be as per IS 1726.
  - (xi) The cover shall be capable of easy opening and closing and it shall be fitted in the frame in workmanship like manner.

#### 10.6 SEALANTS

##### 10.6.1 General

- i. Joint sealing compounds shall seal joints in concrete against the passage of water, prevent the ingress of grit or other foreign material and protect the joint filler. The compound shall have good extensibility and adhesion to concrete surfaces and shall be resistant to flow and weathering.
- ii. Approved Sealant where specified on the drawings shall be provided strictly in accordance with the manufacturer's written instructions, such joints shall be formed to the correct dimensions, thoroughly cleaned and treated with recommended primer strictly in accordance with the manufacturer's written instructions prior to sealing. Wherever width of gap to be sealed is wide enough to necessitate the use of backer rod, the same shall be provided at no extra cost. The contractor shall use only competent personnel experienced in the application of sealant for such work.
- iii. Where specified in the drawings, silicon/polyurethane/ polysulphide based sealants shall be of an approved manufacture. The treatment of the joint and the use of sealing compound shall be strictly in accordance with the manufacturer's written instructions. The entire work shall be carried out as per IS:3414, IS.6509, IS:11433.
- iv. Sealants shall be as follows:  
Silicon sealant shall be one part gun grade type with minimum movement capability of  $\pm 25\%$  and elongation at break of 450% conforming to BS 5889 or TTS 001543A. This Sealant shall be of approved colour and shall be non-staining to the parent concrete surface.

#### **10.6.2 Ancillary Materials**

The Contractor shall provide all ancillary materials such as cleaning solutions epoxy mortar, primer, tool cleaner, bond breaker type, filler boards, back up material, backing rods, polyethylene foam, masking tapes, sealant slot former etc.

#### **10.6.3 Primer**

Primer for sealants shall only be as recommended by the sealant manufacturer, Primer shall have been tested for compatibility and durability with the sealant to be used and on samples of the surfaces to be selected.

#### **10.6.4 Backdrop Material**

Backdrop material shall be an expanded polyethylene of nominal density 35 kg/cum as recommended by the sealant manufacturer. It shall be of non-absorbent and non-staining material compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity.

#### **10.6.5 Bond-preventive Materials**

Bond-preventive materials shall be pressure-sensitive adhesive polyethylene tape or aluminum foil.

#### **10.6.6 Equipment**

The Contractor shall inter alia provide the following plant and equipment for the work. T-paddle, follower plate, solid barrel gun, plastic nozzle, wire brush, heavy duty 500 rpm electric drill, palette knife, masking tape and paint brush for priming etc.

#### **10.6.7 Working Life**

Care shall be taken to ensure that material with adequate shelf life is provided. Material whose shelf life is over shall not be used in the works and shall be removed from the site forthwith. Depending on the storage, temperature and humidity, only one unit shall be drawn from the storage.

#### **10.6.8 Curing Period**

No portion of the work where sealant has been applied shall be allowed to be submerged or be wetted by any liquid for a period of 7 days after application of the sealant. This period may be modified depending on the temperature and humidity prevalent at the time.

#### 10.6.9 Environmental Requirements

The ambient temperature shall be within the limits as given by the manufacturer, when the sealants are applied. The work shall not be carried out in a dusty atmosphere or when it is raining or when the humidity is high. Sealants shall not be applied when the ambient temperature is below 4 degree C. When the ambient temperature is below 10 degree C but greater than 4 degree C, the sealant containers shall be stored for some hours at 21 degree C, to ease mixing and application.

#### 10.6.10 Delivery and Storage

Materials shall be delivered to the job site in the manufacturer's original unopened containers. The containers shall include the following information on the label.: a) Name of supplier,

- b) Name of material,
- c) Formula,
- d) Lot number,
- e) Colour
- f) Date of manufacture,
- g) Mixing instructions
- h) Shelf life and
- i) Curing time

Materials shall be carefully handled and stored to prevent contamination of foreign materials to exposure to temperatures exceeding 35 degree C.

#### 10.6.11 Joints

The effective width to depth ratio shall be as per the table given below unless directed otherwise by the Engineer.

Table

Surfaces	Joint Width	Joint Depth	
		Minimum	Maximum
For concrete masonry or stone:	6 mm	6 mm	6 mm
	Over 6 mm up to 12 mm	6 mm	Equal to width
	Over 12 mm	½ width	½ width

#### 10.6.12 Surface Preparation

##### General

The surface of joints to be sealed shall be clean, dry, sound and free of all release agents, water repellents, laitance, oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale and other foreign substances. Oil and grease shall be removed with solvent and the surfaces shall be wiped with clean clothes.

#### 10.6.13 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil or other such materials, the materials shall be removed by sandblasting or wire brushing, Laitance, efflorescence and loose mortar shall be removed from the joint cavity. The surfaces/edges shall be repaired with epoxy mortar to give smooth and even surfaces to correct lines and levels with a uniform gap for the length to be sealed.

**10.6.14 Application Masking Tape**

Masking tape shall be placed on the finished surface on one or both sides of a joint cavity to protect adjacent finished surfaces from primer or compound smears. The masking tape shall be removed within 10 minutes after the joint shall be filled and tolled.

**10.6.15 Bond-preventive materials**

Bond-preventive materials shall be installed on the bottom of the joint cavity and other surfaces to prevent the sealant from adhering to the surfaces covered by the bond- preventive materials. The materials shall be carefully applied to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond- preventive materials.

**10.6.16 Backstops**

The back or bottom of joints constructed deeper than specified shall be packed tightly with an approved backstop material to provide a joint of the depth specified.

**10.6.17 Primer**

The primer shall be used in accordance with the manufacturer's instructions. The primer shall be applied to the joint surfaces to be sealed only and not spill over or be applied to surfaces adjacent to the joints.

**10.6.18 Application of Sealant**

The sealant shall be gun-applied with a nozzle of proper size to fit the width of the joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. The sealant shall be uniformly smooth and free of wrinkles.

The plastic nozzles shall be inserted on the gun and cut to appropriate size. The sealant shall be gunned into joints using an even trigger pressure. The nozzle shall be cleaned occasionally. The sealant shall be pressed into joints with a wet spatula and tooled within five minutes of application. The jointly shall be tooled slightly concave after the sealant is installed. The tolled joint shall present a smooth and professional joint giving the desired finish and shape. The masking tape shall be removed immediately after tooling.

Application equipment shall be cleaned with a tool cleaner, recommended by the % manufacturer, after wearing PVC or rubber gloves and whist the sealant is still in an uncured state.

**10.6.19 Cleaning**

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealing application as the work progresses. Sealant adhering to, porous surfaces shall be left until is just cured and then removed by abrasion or other mechanical means.

**10.7 FIRE PROOFING OF STEEL STRUCTURES****10.7.1 DELETED.****10.7.6 FINISHING AND JOINT SEALING**

Fire proof coating shall be finished with 2 coats of microporous exterior top coat as recommended by manufacturer, compatible to cement surfaces of approved make colour conforming to IS: specifications.

**10.7.7 TEST**

The contractor shall submit the certificate of test results for the vermiculite cementitious coating over structural member from a laboratory, approved by the Engineer. Test shall be performed as

per the requirements laid down in UL-1709 for 2 hours duration when tested on W10 x 49 I-beam.

#### 10.7.8 MEASUREMENT

Measurement for fire proofing coating of 2hrs shall be in Sqm based on the net surface of structural steel on which it is applied.

#### 10.7.9 APPROVED MANUFACTURERS/ SUPPLIER

All materials and products shall conform to the relevant standard specification, IS codes and other relevant codes etc. and shall be of approved makes and design.

#### 10.8 SPECIFICATION FOR COATING OF PSC GIRDERS AND RCC SUBSTRUCTURES:

##### 1.0 MATERIALS:

1.1.1 The coating materials shall meet the standards specified by various codes and formulation set forth by the patentor.

1.1.2 A written certification shall be furnished to the Engineer that properly identifies the number of each batch of coating material used in the work, material, quantity represented, date of manufacture, name and address of manufacture and a statement that the coating material used must meet the requirements specified by CBRI/Roorkee. Also proof of purchase from CBRI's approved manufacture shall be submitted.

1.1.3 The coating material shall be stored in the manner as per recommendations of the manufacturer until ready for use. The coating material shall be used within the manufacturer's written recommended shelf life.

1.1.4 When a representative sample of the material is to be sent to CBRL, Roorkee laboratory, then the sample shall be packaged in an airtight container and identified by batch number. The cost of testing will be borne by the Contractor.

##### 1.2 SPECIFICATION OF COATING MATERIAL

Sr.N	Description	Primercoat	MiddleCoat	TopCoat
1.	Base	Interpenetrating Polymer (Epoxy phenolic)	Interpenetrating Polymer (Epoxy phenolic)	Interpenetrating Polymer( Aliphatic Polyurethane)
2.	Potlife	1 Hour for 2lt. mix	1 Hour for 2lt.mix	1 Hour for 2lt.mix
3.	Curing	Air Curing	Air Curing	Air Curing
4.	Colour	Clear or as specified by the Engineer incharge	Yellow/Greyor as specified by the Engineer incharge	Yellow/Greyor as specified by the Engineer incharge
5.	Shelf Life	One year in tightly sealed container.	One year in tightly sealed container	One year in tightly sealed container
6.	Dry film thickness	55- 65 microns	90-100 microns per coat	40-50 microns per coat
7.	Coverage	5-6 sq.mt/lt(5.5sq.mt Average)	4-5 sq.mt/lt(4.5 sq.mt Average)	6-7 sq.mt/lt(6.5 sq.mt Average)
8.	Recommended No. ofcoats	One	One	One



9.	Recoatibility	Subsequent coat shall be applied after 6 hours to 7 days	4 hours to 7 days. Ensure the surface is dust and deposit free prior to application	N.A
10.	Mix proportion	Base:1 PBV*/Curing Agent: 1 PBV*-Parts by volume	Base:1 PBV*/Curing Agent: 1 PBV*- Parts by volume	Base:1 PBV*/Curing Agent: 1 PBV*- Parts by volume

1.2.1 Tensile strength: Minimum tensile strength of the coating must be 15 N/mm<sup>2</sup> and it should be determined as per ASTM-2370.

1.2.2 Elongation: Minimum elongation of the coating must be 15% and it should be determined as per ASTM D-2370-73.

1.2.3 Specific permeability: The maximum value must be 0.15 mg/cm<sup>2</sup>/mm/24hr and it should be determined as per ASTM d-1653-74.

1.2.4 Adhesion with concrete: The minimum adhesion with concrete by pullout method must be 2.5n/mm<sup>2</sup> and it should be determined as per BS-3900-E-270.

1.2.5 For consumption calculation of various coats (primer, middle and top), average values of the specified coverage shall be adopted.

### 1.3 SURFACE PREPARATIONS:

1.3.1 In order to have better bonding, the concrete surface should be clean, dry and mechanically sound. The surface of the concrete structure to be coated shall be cleaned of all traces of mould oil, laitance, salt deposits by mechanised means. Finally, the surface should be washed with clean water jet to remove any salt deposits. The surface should be dried. All the protrusions should be removed and cracks, joints should be sealed with IP Net putty as per Central Building Research Institute (CBRI), Roorkee's recommendation.

### 1.4 APPLICATION OF COATING:

1.4.1 Mix the base and curing agent in prescribed proportion by volume thoroughly for 5-10 minutes and allow it to remain in a container for five minutes.

1.4.2 A primer coating of IPN polymer (transparent) shall be applied to the cleaned surface after surface preparation within the pot life.

1.4.3 After air curing, Intermediate and top coating should be applied with time lag as per manufacturer's specification. 1.4.4 The coating shall be applied by airless spray or other approved means.

1.4.4 The coating shall be applied by airless spray or other approved means.

### 1.5 COATING THICKNESS:

1.5.1 **Superstructure and Sub structures-** The minimum total thickness of all coats (primer coat + middle coat + top coat) must be 200+15 microns.

### 1.6 MEASUREMENT OF COATING THICKNESS

1.6.1 During the application of IPNET system clean abraded steel plates of approximately 10cm x 8cm shall be adhered to the concrete surface by means of putty /adhesive in such a way that these can be detached. IPNet system can be applied over the plates in the course of application over the concrete surface. Dry film thickness (DFT) can be measured using magnetic electrometer. DFT measurement should be done every 500 to 600 sqm area or as per the direction of engineer-in-charge.

### 1.7 COATING CONTINUITY:

1.7.1 The coating shall be visually inspected after curing for continuity of the coating and shall be free from holes, voids, contamination, cracks and damaged areas discernible to the unaided eye.

**1.8 PERMISSIBLE COATING DAMAGE AND REPAIR OF DAMAGED COATING:**

1.8.1 All coating damage shall be repaired with patching material by the contractor at his own cost.

1.8.2 Repaired areas shall have a minimum coating thickness of 200+ 15 microns for Superstructure and sub structures.

1.8.3 Repair of damaged coating shall be done in accordance with the patching material manufacturer's written recommendations within the accepted rates.

**1.9 INSPECTIONS:**

The Engineer shall have free entry at all times to the parts of the contractor's works. The contractor shall afford the Engineer's representative all reasonable facilities to satisfy that the material is being furnished in accordance with this specification.

**1.10 TESTING OF MATERIALS:**

Following tests may be performed on the coating materials at CBRL, Roorkee testing laboratory by the contractor and testing report should be furnished to the Engineer

- Tensile strength, N/mm<sup>2</sup>
- Elongation, %
- Specific permeability, mg/cm<sup>2</sup>/mm/24hrs
- Adhesion with concrete ,N/mm<sup>2</sup>

**1.11 CERTIFICATION AND TEST REPORT:**

Engineer shall be furnished with, at the time of completion, written certification that samples representing each lot have been tested as directed in this specification and the requirement have been met. A report of the test results shall be furnished to the Engineer.

**S.11: ADDITIONAL SPECIFICATIONS****PRECAST SEGMENTAL CONSTRUCTION****11.1 TYPE OF CONSTRUCTION**

The box girder superstructure for almost the entire length shall be constructed by precast segmental construction with epoxy bonded joints. The pre-stressing cables will be internal to the concrete. The methodology of construction will be "span by span". Only one end prestressing of permanent cables is contemplated, the other end of the cable being pre-blocked.

The standard spans c/c of piers have been envisaged as 31.0m, 28.0m, 25.0m, 22.0m & 15.0m (station spans). The spans may have curved alignment in plan. 34.0m or longer spans shall be adopted under special conditions, viz. site constraints or any obligatory location.

The usual segments shall be 3.0m in length except the pier segments which shall be 1.975/1.95m each. Standard spans shall be made to either add or subtract usual segments of 3.0m each. Where this is not possible or advisable for some reason, the segments will be of length between 1.5m and 3.0m. Hence the mould / casting bed shall be adaptable to cast non- standard length of segment.

The governing weight of the segments will be of the order of 45t. The maximum span length contemplated for precast segmental construction will be of the order of 31m. In exceptional circumstances, 34m span may be adopted with the approval of the Engineer-In-Charge.

Multiple Shear keys shall be provided at match casted joints at the webs as well as at top flange and soffit slab of the box girder as per IRC:SP-65.

Box girder segments shall be match cast at the casting yard and later transported to location and erected in position. Post-tensioned cables shall be threaded-in-situ and tensioned from one end. Box girder shall cater to two tracks.

**11.2 MATERIAL SPECIFICATIONS****11.2.1 Cement**

Ordinary Portland Cement of 53 grade conforming to IS: 269 shall be used. All other specification will remain same as indicated in S.03 of Section-VII-F of these specifications.

**11.2.2 Reinforcement**

Only Fe500D TMT bars shall be used. All other specification will remain same as indicated in S.05 of Section-VII-F of these specifications.

**11.2.3 Pre-stressing Steel**

Uncoated stress relieved Low Relaxation Steel conforming to IS: 14268, Class 2, shall be used. The nominal diameter shall be 15.2mm with minimum breaking strength of 260.7 kN and minimum 0.2% proof load of 234.6 kN.

The pre-stressing steel accessories shall be subjected to an acceptance test prior to their actual use on the works. (Guidance may be taken from BS: 4447). Only multi-strand jacks shall be used for tensioning of cables. Single strand jack shall only be permitted in special

cases with specific approval of Engineer-In-Charge. Direct and indirect force measurement device like Pressure Gauge) shall be attached in consultation with system manufacturer.

#### **11.2.4 Concrete**

Use of Fly Ash in Concrete as a part replacement of Cement is not permitted in precast prestressed segmental superstructure. All other specification will remain same as indicated in S.03 of Section-VII-F of these specifications.

Fibre reinforcement will be Propex (Fiber mesh 300-e3 / Fiber mesh 150-e3) or equivalent make polypropylene fibres, shall be added to ready-mixed concrete. Bar reinforcement is still considered primary reinforcement. Under normal condition, add to the ready-mix at the plant in the quantity recommended by the manufacturer subjected to the approval of engineer-in-charge. If job conditions warrant fibre reinforcement may be added at the job site provided that fibres are evenly distributed in the mix. Notwithstanding the same, Fibre reinforcement shall conform to IRC:SP:46 (2013).

The physical and chemical properties of the constituents of concrete and so also of the green and hardened concrete shall meet the requirements of provisions of section S.03 and MORTH Specifications for Road and Bridge Works, where relevant or where the standard specifications referred to in the Technical Specifications are silent.

#### **11.2.5 Permanent Pre-stressing**

The permanent pre-stressing cables shall generally be of the type 19K15 and 12K15, as suited to 19 nos. and 12nos. strands of 15.2mm nominal dia. intermediate numbers of strands may also be specified in the design, for which suitable anchorage heads shall be used. All aspects of pre-stressing including the system proper shall be subject to the approval of the Engineer.

The ducts shall be corrugated for internal prestressing and Material specifications of corrugated HDPE ducts used for internal prestressing shall be as specified in S.06 of Section-VII-F of these specifications. Adequate precaution shall be taken to ensure that epoxy material does not leak into joints of the ducts.

Maximum anchorage set- in shall be 6mm. Maximum wobble coefficient and friction ratios shall be 0.0020/metre and 0.17/radian respectively.

#### **11.2.6 EPOXY BONDED JOINTS**

In case of epoxy jointed superstructure, mating surfaces of both adjoining segments shall be effectively prepared by wire brushing, water jetting and /or any other approved means to ensure that the bond breaking material is completely removed. Epoxy of about 1mm thickness on each of the mating surfaces shall be applied (usually by hand application) within 70% of its pot life. Subsequently, the segment shall be brought closer to hug each other and an axial temporary compression of at least 0.3 MPa shall be applied by approved means for a minimum of 24 hrs. The uniform compressive stress may be applied by approved external temporary bar pre-stressing (such as Macalloy or Dywidag bar systems). This shall be accomplished using short HTS bar connecting the adjoining segments. The bars shall be anchored on temporary steel frame, passing through dedicated holes within the girder through. No passing-through holes shall be used in soffit slab or web. Passing-through holes used in soffit slab should be filled with free flow, high strength, non-shrink cement-grout.

The Epoxy shall essentially have properties as indicated below. The contractor shall plan his erection system in such a way that the time elapsed between mixing of components of epoxy applied to the mating surfaces of precast concrete segments and application of temporary axial force does not exceed 60 minutes. No epoxy from a batch for which the time since combining the components has exceeded 20 minutes shall be used.

The broad sequence of operations shall generally comprise placing of all segments of a portion intended to be assembled and prestressed in one stage, touching each other and then visually examining the matching of mating surfaces. Subsequently each segment shall be separated from adjoining segment by a distance just sufficient to apply the epoxy. After applying epoxy, temporary axial compression shall be imparted and maintained for minimum 24 h. Thereafter intended permanent prestress shall be imparted prior to demobilising the temporary axial prestress.

In order to prevent intrusion of epoxy in sheathing, an O-ring with diameter compatible with the size of HDPE sheathing (10-20mm wide and 4mm thick) of polypropylene shall be provided on both mating surfaces.

Nothing extra shall be payable for such temporary stress application including all related works.

The purpose of the epoxy joint shall be to serve as lubricant during segment positioning, to provide water proofing of the joints for durability in service conditions and to provide a seal to avoid cross-over of grout during grouting cable into other ducts.

#### **11.2.7 EPOXY**

Depending upon the ambient temperature range, following types of epoxies are recommended for use:

5 to 20° Celsius : Fast reacting

15 to 30° Celsius : Medium fast reacting

25 to 40° Celsius : Slow reacting

Epoxy comprises two components, namely resin and hardener. Resin must be stirred by a mixer in its container for about 10 seconds or until homogeneity is reached. Thereafter hardener must be added and mixing continued. For a mix of 5 kg batch, a mixing rotor attached to a 350 W, 400 rpm electric machine is recommended or as specified by the manufacturer. The speed of 400 rpm should not be exceeded because higher revolutions will entrap air in the mix, cause excessive frictional heat and therefore shorten the pot life. The mixing time should not exceed 3 minutes and the temperature not allowed to rise above 40°C for fast reacting and medium fast reacting formulations and 60°C for slow reacting formulations. It must be ensured that mixing paddles scrape the bottom and sides of the container, so as to ensure complete mixing of the two components. The mixing should be carried out as close as possible to the place where the epoxy will be applied, so as to avoid loss of time, and therefore wasting of pot life in transport.

The epoxy shall be special purpose proprietary material for the proposed usage with proven past record. Selection shall be subject to the approval of the Engineer. Epoxy shall be tested for its conformance to the FIP-1978 "Proposal for Standard Tests and Verification of Epoxy Bonding Agents for Segmental Construction". Some of the important properties (minimum values) of epoxy are as follows:

Pot-life	: 20 minutes (at 40°C for fast and medium reacting epoxies and at 60°C for slow reacting epoxy)
Open time	: 60 minutes (at upper temperature limit)
Compressive strength	: 60 MPa at 24 hrs and 75 MPa at 168 hrs on 50x50x50 mm cube (at lower temperature limit)
Tensile bonding strength	: after 24 hrs at 100% humidity, should have concrete failure, no joint failure with M40 concrete (at lower temperature limit)
Shear strength	: 12 MPa (at lower temperature limit)
Curing rate	: compressive strength on 50x50x50 mm cube shall be 20 MPa at 12 hrs, 40 MPa at 24 hrs and 75 MPa at 168 hrs (at lower temperature limit)

After receiving every batch, all tests (except shear modulus, instantaneous and deferred modulus in compression and water absorption, heat resistance, shear strength and solubility in water) are required to be done at the site laboratory at prevailing ambient temperature to conform to the uniformity of standard of supplied product. In case the received batch is kept at site for a period of more than three months all tests are required to be re-done.

With every erection, tests for pot life and open time are required to be done at site at prevailing ambient temperature.

Nothing extra shall be payable for providing epoxy and all related operations.

### **11.3 SHOP DRAWINGS AND DESIGN CALCULATIONS FOR CONSTRUCTION PROCEDURES**

#### **11.3.1 General**

The Contractor shall submit according to a schedule, complete details and information concerning the method, materials, equipment and procedures the contractor proposes to use. These shall be called "Method Statements". Method Statements shall be submitted sufficiently in advance of the start of superstructure field construction operations, so as to allow the Engineer adequate review period, which shall not be less than 30 days. The submittals shall invariably include step-by-step erection procedure.

The Contractor's Method Statements shall also include all calculations, drawings and information as may be relevant. Two sets of all required drawings and calculations shall be submitted and resubmitted if and as necessary until approved by the Engineer. The specified number of distribution copies shall be furnished after approval.

#### **11.3.2 Design Calculations for Construction Procedures**

Design assumptions and calculations shall be submitted for temporary pre-stressing, false work, erection devices, formwork or other temporary construction which may be required to complete the work, and which will be subject to calculated stresses.

Design of the false work or erection devices for all superstructure concrete shall be done under the direction of, and sealed by, a registered professional engineer. Calculations shall also be submitted to substantiate the system and method of stressing proposed by the Contractor.

Also, Assumptions and Calculations shall also be submitted to substantiate the system and method of permanent and temporary pre-stressing proposed by the Contractor.

In the sections that follow, specific recommendations for precast segmental construction for superstructure are given apart from certain special aspects of construction.

### **11.3.3 Shop Drawings for Precast Segmental Construction**

The Contractor shall submit detailed shop drawings for approval. The shop drawings shall be based on Execution Drawings issued by Maha-Metro to the Contractor and shall include but not necessarily be limited to the following information:

- a) Fully and accurately dimensioned views showing the geometry of segments including all projections, recesses, notches, openings, block-outs, blister if any and where acceptable, as well as other pertinent details.
- b) Details of any special reinforcing required for handling of segments or for other purposes. Also, all bar bending schedules shall be presented based on reinforcement schedules given in Execution Drawings issued by MAHA-METRO.
- c) Size and type of ducts for all post-tensioning tendons and their horizontal and vertical profiles shall be clearly detailed. Sheathing supports, grout tubes, vents and drains shall be shown including size, type and locations.
- d) Details and locations of all other items to be embedded in the segments such as inserts, lifting devices and post-tensioning hardware shall be shown.
- e) Pre-stressing system details shall include sizes and properties of tendons, anchorages, plates, assemblies and stressing procedure, and details and locations of additional reinforcement necessary to resist anchor block stresses.
- f) Graphs, charts or tables showing the theoretical location of each segment, as erected or placed shall be furnished to the Engineer for his use in checking the erection of the superstructure. Detailed procedures for making geometry corrections shall be described.
- g) Details of grouting equipment, grout mix design and method of mixing and placing grout shall be provided.
- h) Method of installing bearings and expansion joints shall be given including approved manufacturer's recommendations.

### **11.3.4 Forms for Precast Segmental Construction**

All side, bottom, inside, and header forms for precast segmental construction shall be constructed of steel unless use of other materials is approved by the Engineer. Shop drawings shall be submitted for all formwork.

In addition to the requirements of the Standard Specifications, the forms used for pre-casting the concrete segments shall be capable of:

- Match casting for precast segmental construction.

- Producing the segments within the tolerance permitted in the specification.
- Accommodating block-outs, opening and protrusions. Protruding re-bars will be needed at least for diaphragm segments and for second-pour plinths. Anchorages, signalling equipment, OHE Pedestals and cable routing supports shall also be included where needed in precast segments.
- Adjusting to changes in segment geometry as shown in Execution Drawings issued by MAHA-METRO or for correcting previous minor casting errors to prevent accumulation.
- Adjusting to accommodate Maha-Metro logo at the parapet as shown in the tender drawings.
- Adjusting the profile to take into account design camber values.
- Stripping without damage to the concrete.
- The form design shall provide a tight leak-proof jointing to the previous segment. The bulkhead must be capable of connecting the sheathing in a manner to hold their position and prevent intrusion of grout.

Joints in external formwork shall be avoided as far as possible. Where sections of forms are for some reason to be joined on the exterior face of the segment, an offset in excess of 0.5mm for flat surfaces and 1mm for corners and bends will not be permitted.

Forms shall not be removed until the concrete has attained adequate strength as specified elsewhere in the specification. Care should be exercised in removing the forms to prevent spalling and chipping of the concrete.

Forms shall be of sufficient thickness, with adequate external bracing and stiffeners and shall be sufficiently anchored to withstand the forces due to placement and vibration of concrete. Internal bracing and holding devices in forms shall be limited to stay bolts in webs which can be removed from the concrete surface to permit patching following form removal. Joints in the forms shall be designed and maintained for mortar tightness. The grade and alignment of forms shall be checked each time they are set and shall be maintained during the casting of concrete.

Metal forms shall be reasonably free from rust, Grease or other foreign materials. All forms shall be cleaned thoroughly prior to each casting operation. End headers shall be maintained to provide a smooth casting surface.

All formed surfaces for casting members shall be constructed and maintained to provide segment tolerances as specified elsewhere in the specification.

The faces of all forms, other than end headers, shall be properly cleaned and treated with form oil or other bond breaking coating prior to placing concrete. Between adjacent match cast segments and headers bond breaking materials shall be provided as indicated elsewhere in these Additional Specifications. The oil or other materials used shall be of a consistency and composition to facilitate form removal. Materials which appreciably stain or react with concrete shall not be used. Care shall be exercised to facilitate formwork and segment removals without damage to the concrete.

## **11.4 CASTING, HANDLING, TRANSPORTATION AND ERECTION OF PRECAST SEGMENTS**

### **11.4.1 General**



The Contractor shall submit detailed Method Statements for casting, handling, transportation and erection of precast segments. The superstructure shall be erected by the method indicated in the tender or by alternate method submitted by the Contractor, subject to the approval of the Engineer. The stressing system, Cage of reinforcement and lifting details shall be successfully demonstrated on sample segment for prior to casting any permanent segments.

All handling and erection plant and equipment shall be load tested prior to their use at site or when specifically asked for by the Engineer. Any additional material required to cater to any temporary condition including temporary pre-stressing shall be borne by contractor and nothing extra will be paid in this account.

#### 11.4.2 Casting of Segments

- i Casting bed and forms shall be structurally adequate to support the segment without settlement or distortion. The casting bed shall be designed for the hardware needed to adjust and maintain grade and alignment. Special consideration shall be given to those parts of the forms that have to change in dimensions. To facilitate alignment or adjustment, special equipment such as wedges, screws, or hydraulic jacks shall be provided. Fittings shall not interfere with stripping of forms. Grading of the forms and the deck of each segment shall take into consideration the relative position of the member in the structure.
- ii Details for casting bed and hardware for adjustment shall be submitted by the Contractor for the Engineer's approval. Casting of segments shall be done in a single pour. Construction joint is not permitted in segment. Compaction of concrete shall be achieved through form vibrators along with needle vibrators.
- iii The Top surface of the segments shall be finished smooth. Necessary drainage spouts, manhole openings etc. shall be provided as per drawings. These drainage openings shall be kept atleast 3mm and max. 5mm below the top surface as to ensure unobstructed drainage flow through these openings.
- iv After the first segment/pier segment of each unit/span is cast, all succeeding segments shall be match cast against previously cast segments to ensure complete bearing and proper alignment on all mating surfaces and shall be given a unique identification mark so as to be placed at the intended location in the superstructure. A bond breaking material such as flax soap, talc, wax or any other approved material shall be used between previously cast segment and newly cast segment, as well as the end headers when required.
- v Segments shall not be moved from the casting yard until stipulated strength requirements have been attained and shall be supported in a manner that will minimize warping. Under any circumstances the concrete shall have attained a minimum compressive strength of 20MPa at the time of removal of forms. At the time of lifting and assembly of precast segments into the structure, the concrete shall have attained sufficient strength to withstand the handling stresses. Curing of segments may be achieved through water or steam followed by water curing as decided by the Engineer-In-Charge.
- vi A full-scale mock-up of the lifting and holding equipment (including assembly truss, cantilevering formwork etc) shall be performed to demonstrate their adequacy and efficacy prior to beginning any erection/assembly of the segments.

#### vii Tolerances in Precasting:

Finished segment tolerances should not exceed the following:

Length of match-cast segment (not cumulative)	± 5 mm
Overall span length between bearings	±10 mm
Web thickness, depths of top and bottom flanges, Width of top and bottom flanges, overall depth of segment, thickness of diaphragm	± 5 mm
Grade of form edge and soffit	±1.0mm/m
Tendon hole location	±3.0mm
Position of shear keys	± 5 mm
Tolerance for erection of the span: Horizontal and vertical position of the at-pier-segment shall be within 15mm of the longitudinal alignment and grade.	

Positioning and arrangement of prestressing tendons in the segmental structure shall be as per IS 1343:2012. The permissible tolerance in the location of prestressing tendons shall be ±5mm.

#### viii **Casting of Pier Segment:**

Pier segments transfer the load from the superstructure to the substructure of the bridge. They contain some component of a diaphragm or heavily reinforced concrete wall to transfer the load.

Pier segments have critical structural components that must be planned during the design, shop drawing, formwork design and purchasing phases. These might include an increased number of post-tensioning anchorages and ducts, heavier reinforcing densities, sleeves for temporary and future post-tensioning, personnel access, accommodations such as sleeves or block-outs for bearings and seismic restraining units, accommodations for drainage and utilities. Extensive conflict resolution for permanent materials and sleeves should be performed during design.

Accordingly, Each Pier segments are mandated to be tested for Ultrasonic Pulse Velocity (UPV) test. UPV test to be conducted before using the same in match casting of typical span segment. No additional payment shall be payable to the contractor on this account.

- ix In span-by-span erection, pier segments are typically cast in a casting cell that operates in short-line fashion. Pier Segments are cast "square," with both bulkheads perpendicular, to reduce geometry requirements and form adjustments, processes better handled in casting the adjacent typical segments. A custom bed can be designed to mass-produce a pier segment type, similar to typical segment casting.

#### x **Shear Keys**

Precast segments shall be provided with shear keys at match cast joints conforming to IRC:SP-65. These shear keys shall cover as much area of the cross section as possible. Shear keys in the webs shall be smaller in size and more in number whereas those in top flange and bottom flange may have larger sizes with lesser number. Shear keys shall be dimensioned in the form of trapezium. Shear keys shall be avoided at the tendon hole locations.

#### xi **Segment Dimensioning**

The segment lengths must be dimensioned keeping adequate allowance of the epoxy thickness applicable after the imparting temporary prestressing. This is to ensure correct placement/alignment of bearings.

**xii Deviator Blocks**

Sufficient number of Deviator blocks to be provided inside the box-girder in order to pass the prestressing ducts for future prestressing as the case may be.

- xiii The anchorage system shall permit tendons to be inserted in the member after erection of segments and tensioned from one end only. Use of prestressing couplers are not permitted.
- xiv Care shall be taken to ensure that deformations of match cast segments due to thermal gradients caused by the heat of hydration of the new cast concrete are negligible. These deformations shall be prevented by properly protecting both the match cast and new cast segments with curing blankets and plastic sheeting. Both the previous segment and the new segment will be maintained at the same temperature.
- xv Reinforcing steel shall be fabricated in cages/jigs and placed according to the Execution Drawing issued/approved by MAHA-METRO. Any conflict or interference with the proper location of sheathing and / or reinforcement or block-outs shall be promptly resolved, and corrections made as directed by the Engineer. No reinforcing steel shall be cut and removed to permit proper alignment of stressing conduits. Any bar that cannot be fabricated to clear the post-tensioning ducts shall be replaced by additional bars with adequate lap lengths and shall be submitted to the Engineer for approval.
- xvi Concrete down-stands/Niches in pier segment –The segmental girders follows the longitudinal designed profile of the viaduct, so also the bottom of the girder. Since the pier segment (which is about 2.0m long) has to rest on the bearings over the whole area for the proper transmission of the load and as the segment bottom follows the gradient of the line, it becomes necessary to provide concrete 'down stands' (in the shape of trapezium like a wedge) integrally cast with the pier segment for normal transmission of load to the bearings. Alternatively, 'niches' (again in the shape of the trapezium) can be provided in the pier segment to serve the same purpose. However, the niches have the disadvantage that the bearings cannot be inspected thoroughly but by the jacking up the girder. However, if down stands are provided, then bearings are easily available for visual inspection. Hence down stands are the desirable alternatives. This applies in cases of all girders viz. Box girders, 'U' girders or 'I' girders.
- xvii Positive means of holding the sheathing in its correct position shall be provided in all cases and shall be indicated on the GFC/working drawings submitted for approval. During the concreting, sheathing shall be stiffened from the inside by rubber or plastic hoses or by inflatable rubber tubes.

**11.4.2.1 CASTING METHODS**

For precast segmental construction using match-cast segments, careful checks of both measurements and computations of geometry shall be made by the Contractor before moving segments from their casting position. Computed coordinates of all sections cast shall be completed before casting a new segment. For casting of precast segmental superstructure, there are two commonly known techniques of precasting (i) Long Line method and (ii) Short Line method. The Contractor has to select the option carefully and provide appropriate type of formwork as well as casting and handling operations. The "short

line" method requires much greater precision in the work as compared to the "long line" method. Therefore, Long Line Method is preferred and recommended for implementation.

#### **A. The "Long Line" Method**

The principle of the long line method is the casting of the segments, in their correct relative position, on a long line casting bed which exactly reproduces the profile of the structure. One or more formwork units move along this line. The formwork units are guided by a preadjusted soffit. A long line is easy to set up and to maintain control over the production as well as the geometry of the segments. The segments shall be cast by long line method for spans curved in plan.

After stripping the forms, it is not necessary to take away the segments immediately. Substantial space may be required for the long line. The theoretical length for casting alone is normally slightly more than the length of the longest span of the structure. It must be constructed on a firm foundation which will not settle or deflect under the weight of the segments. In case the structure is curved, the long line must be designed to accommodate horizontal and vertical curvatures as well as twists, if any. Because the forms are mobile, equipment for casting, curing, etc. has to move from place to place.

#### **B. The "Short Line" Method**

The short line method is mentioned here as a possible alternate.

The segments are cast at the same place in stationary forms and against a neighbouring element. After casting, the neighbouring element is taken away and the last element is shifted to the place of the neighbouring element, clearing the space to cast the next element. The space needed for the short line method is small in comparison to the long line method, approximately three times the length of a segment for one short line. The entire process is centralised. Horizontal and vertical curves and twisting of the structure are obtained by adjusting the position of the neighbouring segment and through specified formwork.

To obtain the desired structural configuration, the neighbouring segments must be accurately positioned and requires very precise workmanship, quality control procedures, and geometry control. Care must be taken that the formwork be sufficiently flexible to allow for adaptation at the joint with the accurately positioned matching segment.

If short line method is adopted, the deck segments should follow profile as given below:-

##### **Suggested Deck Alignment on Vertical Curves**

##### **a) On Vertical Summit Curves**

On vertical summit curves, deck will follow the path of straight line joining the two points on adjacent piers. These two points shall have the minimum offset from rail level to deck level as specified by Engineer at all points along the length of girder.

##### **b) Vertical Valley Curves**

On vertical valley curves, deck will follow the path of straight line joining the two points on adjacent piers. The minimum offset from rail level to deck level as specified by Engineer shall be ensured at all points along the length of girder.

##### **(c) Suggested Deck Alignment on Circular / Transition Horizontal Curves**

On circular / transition horizontal curves, each segment of the deck will follow the profile of short chord line. The bottom and side form for segment to be cast are positioned to span between the stiff fixed end bulkhead and the previously match cast segment. The

previously match cast segment shall be oriented w.r.t segment to be cast and it should be ensured that fixed bulkhead always remain perpendicular to end face of formwork.

Due to orientation of match cast segment, the length of segment towards inner side of curve will be less and towards outer side of curve will be more than segment length along centreline. The formwork to be used should have flexibility to adjust the segment length on both sides by adjusting the position of the match cast segment without any additional pieces and it shall be ensured that offset of match cast segment and segment to be cast is limited to value so calculated.

#### **11.4.3 SEPARATION OF MATCH-CAST SEGMENTS**

The Contractor shall provide equipment to be used for uniform separation of match cast segments without damage. The method as well as details of the equipment to be used for separating match cast segments shall be included in the shop drawings. A bond breaking material shall be used in the form of wax only on the webs and soffit slab of the previously cast segment and a newly cast segment, as well as the end headers when required. The material shall not be injurious to the concrete and shall permit removal of a segment without adhesion of the concrete. Any breakage in segment end face during separation / handling shall not be repaired, unless specifically accepted by the Engineer, in which case repairing at end face of segment shall be done with epoxy at the time of epoxy application. Segments with excessive breakage shall be rejected. Decision of the Engineer shall be final binding in this regard.

#### **11.4.4 HANDLING, STACKING AND ERECTION OF SEGMENTS**

The Contractor shall be responsible for the proper handling, lifting, storing, transporting and erection of all segments so that they may be placed in the structure without damage. Segments should be handled carefully, without impact, in a manner that limits stresses to values compatible with the strength and age of the concrete. Location of lifting holes and inserts should be determined carefully to prevent damage of segments during handling. Only HTS bar such as Macalloy or Dywidag shall be used for lifting/handling of segment at any stage of construction, with due care for fatigue considerations (multiple re-use). Transportation over uneven surfaces may produce static and dynamic stresses which need to be considered, especially at an early age of a segment. Special care should be exercised during handling and transportation to protect cantilevers or projections against damage or cracking.

The Contractor shall furnish calculations to establish that the stresses induced during any stages of construction shall not exceed 50% of the cube strength achieved at that stage, nor 40% of the specified 28 days cube strength. In addition, the following limitations shall be observed:

- a) The segment shall not be lifted from the casting bed till the concrete reaches a minimum of 25MPa Cube strength.
- b) The age of the concrete shall not be less than 14 days at the time of its erection provided it has achieved its specified 28 day strength.

Segments shall be maintained in an upright position at all times and shall be stored, lifted and/or moved in a manner to prevent torsion and differential deformation other undue stress. Stacking yard should be properly prepared to prevent any settlement under the segments. Members shall be lifted, hoisted or stored with lifting devices approved on the shop

drawings. Stacking should be limited to 2-Levels to avoid excessive direct or eccentric forces.

Segment shall be stacked with three-point support in curing tank / stacking yard, or as approved by MAHA-METRO. Curing shall be done using sprinkler system and it has to be ensured that all parts of segment are water cured during water curing period.

#### **11.4.5 CLEANING, TRANSPORTATION AND ERECTION OF SEGMENTS**

- A. Before transportation of segment, mating surface shall be cleaned by water rinsing and sand blasting as approved by the Engineer. When sand blasting is employed, surface shall be abraded to an extent that:
- Bond breaker such as wax applied during match casting is removed.
  - Laitance is removed so that small aggregates are just exposed.
  - Cleaned surface is neither polished nor excessively rough.

**B. Transportation of Precast Segments/girders from Stack Yard to the Erection Site:**

Before the segments are transported to the erection site, it is important to verify that all quality control documents are properly completed, and that the segment has been accepted for incorporation in the bridge. As a minimum, the segment should be checked for the following:

- 1) Adequate Concrete strength is achieved as per the design requirements/approved drawings .
- 2) Specified curing duration is met.
- 3) All the patching and repairs are completed and accepted by the quality control inspectors.
- 4) All permanent and temporary post-tensioning ducts are checked for obstructions, correct layout, and placement.
- 5) All inserts are checked for correct placement.
- 6) Proper identification and orientation of the segment.
- 7) The segment match cast face has been pressure washed or sandblasted as specified above.

The Contractor shall submit to the Engineer-In-charge for approval of the precast segment/girder transportation plan identifying the loading and transportation procedures, including, but not limited to, the proposed route, schedule and traffic control procedures.

The Contractor shall be responsible for the design, supply, installation and removal of temporary bracing for girders as may be required during the Contractor's handling and transportation of the precast segment/girders. Should the Contractor choose to transport the precast segment/girders to a temporary storage location, he shall be responsible for additional loading, transporting, unloading and storage procedures. The submission of design calculations and Shop Drawings for the temporary bracing to the Engineer shall in no way relieve the Contractor of the full responsibility for the success or failure of the design.

In all traffic control situations, the flagman/traffic marshal must be trained and properly attired in flagman's vest and approved headgear with approved flagman's stop/slow paddle or fluorescent red flag. No additional payment is to be made for Traffic Marshal/Flagman involved in the segment transportation.

When transporting bridge girders, the Contractor shall be responsible for ensuring the following:

- Pilot vehicles to accompany the transporting vehicle/hauler.
- All of the required permits have been acquired and the conditions of all permits are met.
- Extreme care shall be exercised during the handling and transportation of the precast girders to avoid twisting, cracking or other distortion that may result in damage to the girder.

**C. LAUNCHING:**

There are broadly two ways of launching the segments. One using Underslung Launching system and the other using overhead Launching system. The former entails lesser height during construction and is comparatively slower. The later one is faster, has increased vertical clearance beneath the superstructure because of the load-carrying members are above the Viaduct slab level and hence offers better method of launching. It entails hanging of segments with wire ropes using electrically controlled pulleys mounted over the Overhead Launching Girder (LG). The Overhead Launching Girder (LG) method is preferred and suggested for implementation in this special specification. Further, Underslung Launching Girder Method may only be applied upon prior approval of the Engineer-In-Charge.

The superstructure shall be constructed by implementing sequential "span by span" construction method. The LG is to be supported either on the bridge piers, on the edge of the previously erected span and the next pier. The precast segments are to be placed and adjusted on a steel erection girder spanning from pier to pier, then post-tensioned together in one operation. The post-tensioning tendons are continuous from pier segment to pier segment.

The typical Overhead launching girder (LG) envisaged here is slightly longer than 2 spans. It must also be able to negotiate curves and accommodate for the gradients/camber if any of the structure as per the approved GAD. The launching girder should be capable of lifting the segments for the span to be erected from ground level and in case required, it should also be capable of feeding the segments from the rear end over the already erected span.

A suitable number of separate set of launching girders are essential in order to proceed at the contemplated pace for completion of project in time. However, Contractor shall furnish the construction scheme and nos. of launching girders, he proposes to deploy in order to ensure completion of project within scheduled time.

The Contractor shall submit the design notes & calculations, shop drawings and detailed method statement of precast segment/girder erection plan, proof checked by third party, for the approval of the Engineer-In-Charge which shall include but not necessarily be limited to the following:

- a) Type and capacity of equipment
- b) Sequence of operation, including position of cranes, trailers with girders, and traffic accommodation for all stages of unloading and erection.
- c) Risk, Safety and Hazard Plan

- d) Technical specification of LG including weight of LG, Length of LG, maximum working span, maximum working gradient, minimum working radius of curvature etc.
- e) Method of Erection of Launching girder.
- f) Method of Erection of First span.
- g) Method of Auto-Launching.
- h) Method of Disassembly/Dismantling of LG.

It is emphasized that for precast segmental construction only one-end pre-stressing shall be used.

### **Erection of Station Girders and Slabs:-**

Contractor has to provide his own proposed erection scheme and supporting calculations with the offer. Contractor will submit and get approval from Engineer of the detailed design of the full erection equipment and scheme before starting the erection. Contractor will coordinate with Pune Traffic Police and Engineer before and during the erection ,contractor to develop detailed traffic diversion scheme.

#### **11.5 DELETED**

#### **11.6 DEFLECTION AND CAMBER DATA**

The Contractor shall submit deflection and/or camber data for each stage of construction as required to construct the structure to its final grade. The procedure used shall account for the effect of the time-dependent prestress losses and creep which will occur during the construction phase. The Contractor shall prepare and implement a camber control plan and submit the same as a part of Technical Design Submission to the Engineer for approval. The data for the entire bridge, based on the Contractor's proposed erection sequence, method and schedule, shall be submitted to the Engineer for review prior to commencing construction.

The camber of the structure will be monitored by the Contractor at each stage and corrective actions as approved by the Engineer shall be performed by the Contractor to assure proper erection of the structure to its final grade.

The camber control plan shall include, but not limited to, the following information:

- a. Camber calculation method (in consultation with the Engineer), and
- b. Calculated and actual camber (differential deformation between End-span and Mid-span) of each girder at each stage, such as:
  - at transfer of prestress;
  - after installation/construction of accessories;
  - at handover to the track contractor (at milestones);
  - at the Static Inspection (or at the Time of Completion); and
  - at any stage which the Engineer may require.

#### **11.7 MISCELLANEOUS**

The entire construction work shall be geared towards minimizing disruptions to road traffic. Also, the occupation of roads during all construction activities shall be reduced to a minimum and subject to the approval of the Engineer. Reinforcement shall be fabricated in cages in casting yard for piles, pile caps and piers before being brought into position for expediting the activities.



All elements of sub-structure below bearing pedestals viz piles, pile caps, piers and pier caps shall each be cast in single pour.

#### **11.8 LOAD TESTING OF LAUNCHING GIRDER**

Contractor shall conduct full scale load test of all launching girder prior to using it for execution purpose. Such tests are required to be done for all the launching girders engaged for project, even if the similar design of launching is adopted.

Nothing extra will be payable for conducting such test and the rate shall be included in respective item.

**S.12: ADDITIONAL SPECIFICATION FOR EARTHWORK**  
**IN METRO RAILWAY FORMATION**

**12.1 General:**

Earthwork for Metro Railway Formation (Embankment and Cutting) shall be as per RDSO's Comprehensive Guidelines and Specifications for Railway Formation, Specification No. RDSO/2020/GE: IRS-0004 and Guidelines for Earthwork in Railway Projects Guideline No. GE : G-1 July 2003 with latest correction slips, as applicable for suitability of soil, construction processes, sampling, testing and acceptance. This has been summarized hereunder for general guidelines and for details, aforesaid Guidelines may be referred to.

**12.2 Site Clearance:**

Before work is started, the site shall be properly and effectively cleared by the contractor of all small trees (of girth up to 30 cm), roots, bushes, heavy grass etc. The Contractor shall arrange removal of rubbish and other excavated material excluding earth from the periphery of the area under site clearance. High portions of the ground shall be cut down and hollow depressions filled up to the required level with the excavated earth so as to give an even neat and tidy look. The work of this nature will be covered by the initial rate for earth work, unless stated to the contrary in the agreement.

Trees of girth over 30 cm, measured at a height of 1m above ground level, shall be considered as large trees. Cutting down of large trees shall be paid extra at the rate specified when stumps are grubbed up in addition. Large trees shall not be cut without specific orders from the Engineer. As few trees shall be cut as is absolutely necessary for the execution of work. The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below subgrade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipelines, cable, etc. adjacent to the area which are not required to be disturbed during site clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable. In case any damage to the pipelines, cables, etc. is done due to negligence on part of the contractor the necessary damage charges will be recovered accordingly.

Any trees cut down or building materials released from dismantling of structures shall be stacked by the contractor within a distance of 500 meters outside the periphery of the area under site clearance as per instructions of the Engineer. The contractor shall have no claim to the trees or other material removed during site clearance and the same shall be the property of the Maha-Metro.

**12.3 Demarcation and Profiles:**

Centreline of the alignment with a (@ 25 m c/c or so) and full construction width should be demarcated with reference pegs/dug belling. This is to be considered as part of the setting out of work, and preliminary to contractor being allowed to start the work. The cost of this is included in the initial rate for earthwork.

The contractor before starting any work, shall take charge of all benchmarks, centre line, demarcation and other field stones and reference pegs and be responsible for their subsequent preservation, and should they disappear or be destroyed after he has taken them over, he shall pay the cost of their replacement or replace them at his own level in consultation with the department.

#### **12.4 Measurements:**

Cutting and banks are to be excavated and made up neatly to the lines shown in the cross section as per approved construction drawing. No payment will be made for excess work done outside these lines except when such work is so ordered in writing by the Engineer. However, if any bulges are left in the slopes of cuttings due to practical difficulties and are permitted, deduction as per actual measurements will be made. Similar action will be taken in case of concave surfaces in the slopes of embankments, if permitted.

Should the Engineer so desire, he may, at any stage of the work, order the Contractor to increase or reduce the slopes of any cutting or bank or alter the formation level, in which case the amount of work actually done will be paid for in accordance with the specifications and the BOQ.

In computing the quantity of earth work in cuttings and side drains, no cognizance will be taken of the additional excavation, which may be necessitated during the progress of the work due to the presence of boulders or other material, and payment will only be made for the quantity as per cross sections required to be provided.

#### **12.5 Payment:**

It must be clearly understood that the Contract rates are intended to cover the full cost of finished work. Banks and cuttings are to be carefully dressed to formation with such slopes as may be specified in each case. The payment for the quantity of earth work in cutting / bank shall normally be made on cross sectional measurements. The existing ground / bank profile shall be taken and plotted by the Authorised representative of the Engineer in the presence of contractor or his authorized agent before commencement of the work. The profile of the bank or the cutting required to be provided including allowance of settlement in case of embankment, shall also be plotted on the same sheets. The levels and cross sections shall be signed by both the Authorised representative of the Engineer and the contractor / his authorized agent. (The profiles of the bank or cutting as required to be provided are for the guidance of the contractor and not for the purpose of measurements).

The profiles of the finished and plotted bank/ cutting shall like-wise be taken in the presence of the contractor or his authorised agent and super-imposed on the original ground profile. These profiles are to be taken at locations as directed by the Engineer, at least at 15m intervals on straight and at least at every 10m on Curves with radii sharper than 600m and at extra locations in special cases such as irregular or side long ground etc.. The gross volume of earth work shall be calculated from the original and finished profile of the bank/ cutting.

#### **12.6 Suitability of Sub-Soil:**

Field tests are required to be conducted on sub-soil strata, i.e. Plate load test for determination of Elastic Modulus in second cycle of loading (Ev2), Standard Penetration test to determine N-value, and Unconfined Compression Test or Vane Shear Test to determine unconfined compressive strength or undrained cohesion, cu. If any of these parameters, as specified in following para do not meet with specified requirement then ground improvement or removal/replacement of weak sub-soil needs to be undertaken.

Sub-Soil needs to conform to the following specification:

- (i) Ev2 value (PLT)  $\geq 20\text{MPa}$ , or
- (ii) Undrained cohesion of soil ( $C_u$ )  $\geq 25\text{ kPa}$ , only for soils having particles finer than 75 microns exceeding 12%, or
- (iii) (iii) N-value (SPT)  $< 5$ ,
- (iv)

#### 12.7 Earth Work in Embankments:

- i) **Formation Width:** The formation widths are to be as shown in the drawings.
- ii) **Side Slopes:** The side slopes will ordinarily be 2:1 or as specified in the drawing. The side slopes shall be carried up simultaneously with the rest of the work and not filled in afterwards. This can only be ensured by insisting on the whole width of embankment from the toes of the slope coming up simultaneously.
- iii) **Dressing of earthwork:** After completion of earth work the slopes shall be neatly dressed to the correct profiles, and shall be made up where required during the maintenance period. The top should be neatly dressed off sloping at an inclination of 1 in 30 either side from the centre line unless otherwise specified in the drawings.
- iv) **Selection of Earth:** The disturbed / undisturbed soil samples along with the test results as per specifications will be submitted by the contractor for approval of the source from where the earth is proposed to be borrowed before the Earth work in embankment is started or in case of change in location of the source.
- v) **Specification of Subgrade:** The specifications prepared subgrade, subgrade should conform to the SoilQualityClass SQ1/SQ2/SQ3 as specified in the RDSO's Comprehensive Guidelines and Specifications for Railway Formation (RDSO/2020/GE: IRS-0004, September- 2020).

#### 12.8 Blanketing:

The specification and work of blanketing material should conform to the specifications provided in RDSO's Comprehensive Guidelines and Specifications for Railway Formation (RDSO/2020/GE: IRS-0004, September- 2020). Normally, the blanket material shall be produced mechanically by crushing the stones and/or by mixing, naturally available materials using suitable equipment/plants like pugmill, wet mix plant, crusher etc. as specified in the Appendix-A of RDSO's Comprehensive Guidelines and Specifications for Railway Formation (RDSO/2020/GE: IRS-0004, September- 2020). No extra payment shall be made in case of mechanical production of blanket material. However, if naturally available material conforms to the specifications, the same can also be used.

The parent material of the blanket material so chosen should be chemically inactive and sturdy in normal working environment. Brickbats, factory slag, weak dissolved stones like lime, shale, laterite etc. need not be selected as blanket material.

The contractor should submit for approval by the Engineer samples of the Blanketing material. The material to be used by the contractor for blanketing should strictly adhere to the quality of material as approved by the Engineer.

#### 12.9 Mechanical Compaction:

- i) The spreading of material in layers of 200 to 300 mm thickness over the entire width of embankment should be done by mechanical means and finished by a motor grader. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the slope and grade.
- ii) Compaction to specified levels of RD or percentage of MDD shall be carried out through a number of passes of vibratory rollers of 100-120 kN static weight or of equivalent capacity as approved by the Engineer. A combination of vibrating rolling initially, and static finishing rolling may be established through trials. Speed of roller shall not exceed 5 km/hr. However, the Contractor should get the Engineer's approval for the type of equipment to be deployed for compaction.
- iii) Density of soil will increase with the number of passes of roller but after optimum number of passes, further increase in density is insignificant for additional number of passes. For determination of optimum number of passes for given type or roller and optimum thickness of layer at a predetermined moisture content, a field trial for compaction is necessary which will be arranged by the Engineer for which the Contractor shall make all arrangements and bear the cost of test / tests as required.
- iv) If natural moisture content (NMC) of the soil is less than the OMC, calculated amount of water based on the difference between OMC and NMC and quantity of earthwork being done at a time, should be added with sprinkler attached to water tanker and mixed with soil by motor grader or by other means for obtaining uniform moisture content. When soil is too wet, it is required to be dried by aeration to reduce moisture content near to OMC. Efforts should be made to keep moisture content level of the soil in the range of OMC + 2% at the time of compaction.
- v) Fill shall be placed and compacted in layers of specified thickness. The rate of progress should be, as far as possible, uniform so that the work is completed to final level almost at the same time.
- vi) The rolling for compaction of fill material should commence from edges towards center with minimum overlap of 200mm between each run of the roller. In final pass, roller should simply move over the surface without vibration so that top surface is properly finished.
- vii) Extra bank width of 500mm on either side shall be rolled to ensure proper compaction at the edges. The extra soil would be cut and dressed to avoid any loose earth at the slopes. This should preferably be done with help of grade cutter. The earth so cut in final stages will not be paid but can be used at other places by the contractor.
- viii) At the end of the working day, fill material should not be left uncompacted. Care should be taken during rolling to provide suitable slope on toe of the bank to facilitate quick shedding of water and avoid ponding on formation.
- ix) Top of the formation should be finished to cross slope of 1 in 30 from one end to other towards cess / drain in multiple lines and from center of formation to both sides in single line or as indicated in the drawing.

## 12.10 Quality Control of Earthwork

Quality of execution of formation earthwork shall be controlled through exercise of checks on the fill material, blanket material, compaction process, drainage system, longitudinal & cross-sectional profiles of the finished embankment. The details of quality control procedure are as follows:

**12.10.1 Suitability tests at source of Embankment fill/prepared subgrade/Blanket Material:** Fill/Blanket material proposed to be used would have to be assessed for its suitability, as stipulated in this specification, after conducting soil classification and other relevant tests as per site requirement. Once the material has

been found fit for use as fill material for Embankment, further lab tests, to assess OMC, MDD/ Relative Density, need to be conducted. The type and frequency of tests to be conducted will be as per table 7.2 of RDSO's Comprehensive Guidelines and Specifications for Railway Formation (RDSO/2020/GE: IRS-0004, September- 2020).

### 12.10.2 Quality Control Checks on Finished Earthwork

**12.10.2.1 Compacted Earth:** Degree of compaction of each layer of compacted soil/blanket should be ascertained by measurement of dry density/Relative Density of soil at locations selected in specified pattern. The method of sampling and method of tests to be conducted to be adopted are as stipulated in the RDSO's Comprehensive Guidelines and Specifications for Railway Formation (RDSO/2020/GE: IRS-0004, September- 2020) unless otherwise approved by the engineer.

a) **Frequency of Tests:** Density check would be done for every layer of compacted fill/blanket material as per following minimum frequency:

- i. At least one density check for every 30 m length for blanket layers and top one metre of prepared subgrade/subgrade along the alignment in a staggered pattern of each compacted layer.
- ii. At least one density check for layers other than as specified in (i) above, every 500 m<sup>2</sup> or 75 m c/c whichever occurs earlier along the alignment in a staggered pattern of each compacted layer.

### 12.10.2.2 Acceptance Criteria

i) The blanket material, which contains fines passing 75 micron IS Sieve, upto 5 percent should have the Density Index (Relative Density) a minimum of 70% as obtained in accordance with IS: 2720 ( Part 14 ) – 1983 (Reaffirmed 2015).

ii) For other materials, field dry density should not be less than maximum attainable dry density obtained in field compaction trial. However, in field compaction trial, the maximum attainable dry density should not be less than 98% of MDD values as obtained by Heavy Compaction Test (IS: 2720 (part 8) – 1983) in the laboratory. In case, there are difficulties in achieving 98% of the MDD values as obtained by Laboratory test, in the field trials, the same may be relaxed upto 95% of MDD with the specific approval of Engineer, recording reasons of such relaxation.

**12.10.2.3 Deformation Modulus (Ev<sub>2</sub>) measurement:** It is a parameter expressing the deformation characteristics of a soil. It is calculated taking values from the load settlement curve obtained from the second cycle of loading in the Plate Load Test. It is to be determined in the field on top of each formation layer i.e. at top of compacted Blanket layer/Prepared sub-grade/Subgrade- Top & Lower layer.

**12.11 Formation Level:** Finished top of sub-grade level may have variation from design level by + 25 mm and finished top of blanket layer may also be permitted to have variation from design level by plus 25mm.

**12.12 Cross Slope:** Cross slope should be within 1 in 28 to 1 in 30.

**12.13 Side Slopes:** Side slope should be 2H: 1V or flatter as per design.

**12.14 Formation Width:** Formation width should not be less than the specified width.

**12.15 Quality Control Records:** At least, following records of quality control as per proforma approved by the Engineer-In-Charge needs to be maintained.

- a) Characteristics of fill/sub-grade materials.
- b) Quality of blanket materials.
- c) Field compaction trial computation sheet details.
- d) Quality of compaction of earthwork including blanket material.
- e) Quality of material and its compaction for backfill behind bridge.
- f) Details of machineries engaged in execution of earth work including its output.



**S.13: ADDITIONAL SPECIFICATION FOR FABRICATION & ERECTION OF OPEN WEB GIRDER****13.1 General:**

This chapter covers the supply of material, fabrication, assembly and erection of Open Web Girder (OWG) and bearings. The following are the brief specifications and general guidelines for fabricating and erecting the girders but not limited to and shall be read in conjunction with Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001).

High Strength Friction Grip Bolts (HSFGB) shall be used as per drawings.

Protection screen is to be provided portion as per RDSO Drawing No. RDSO/ETI/0068 (latest version).

All workshop fabrication shall be done using Automatic SAW (Submerged Arc Welding) process only. All welding, other than workshop welding, shall be done through Gas Shielded FCAW (Flux Core Arc Welding) process only. SMAW (Shielded Metal Arc Welding) also known as Manual Metal Arc Welding shall NOT be permitted anywhere in the structure. FCAW wire to be used shall be Flux Core Tubular consumable electrode to generate flux gas in addition to gas cover of CO<sub>2</sub>, Argon or /CO 2- Argon mixture only. In FCAW process, wind screen and /or enclosures shall be providing around the welding location to prevent shielding gas from blown out. Welding shall be performed on prepared metal surfaces free from rust, dust, moisture etc. And before every new pass, slag must be carefully chipped off from weld surface. Radiography test shall be conducted to ensure weld quality. Method of launching shall be approved by Indian Railways for which no extra payment will be made to the Contractor.

**13.2 Site Inspection:**

Tenderers are requested to inspect the site and carry out careful examination to satisfy them as to the nature of work involved and facilities available at the site. They should note carefully all the existing structures and those under construction through other agencies. They should also study the suitability of utilizing the different equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of locating their store yard, laboratory, staff quarters etc., and satisfy themselves with regard to the feasibility of transporting the plate girders from the yard to the final site of placement etc.

**13.3 Materials:**

Steel (Plates and Rolled sections) should conform to IS: 2062-2011. It shall have Sub quality 'B0' & Grade E250 (Fe410) or E350 (Fe 490) as mentioned in the tender schedule/drawing and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans.

Material supplied by the manufacturers shall be ultrasonically tested as per codal provisions at the manufacturer's premises before dispatch. The contractor on receipt of supply in his factory premises/fabrication workshop may have to carry out random USFD testing as per standards laid down in various codes and verify them with the list received from manufacturers, if instructed by the inspection agency/ Site Engineer. Only tested steel shall be used for fabrication. The steel shall comply in all respects with the requirements of approved drawings and relevant codes and specifications, and it may be noted that quality of steel used for fabrication shall be the essence of the contract & shall be rigidly followed.



Structural Steel shall be procured as per specification mentioned in BIS's documents – IS: 2062- 2011. Independent tests shall be *conducted*, wherever required, to ensure that the materials procured conform to the Specifications. These steel shall be procured only from manufacturers in the approved vendor's list of Maha-Metro.

#### **13.4 Test Certificates& Testing:**

All materials for the work shall pass Mechanical test, Charpy test, Chemical Analysis, etc. prescribed by the relevant IS specifications or such other equivalent specifications. For all materials including HSFG bolts, the contractor shall furnish copies of test certificates from the manufacturers including proof sheets, mill test certificates, etc. showing that the materials have been tested in accordance with the requirements of various specifications and codal provisions. If any further testing of materials is required by Engineer in respect of these and other items, it shall be arranged for by the contractor at approved laboratory/NABL accredited Laboratory as approved by Engineer. For this, nothing extra shall be payable and accepted rates in the schedule of items shall be deemed to include this.

Even satisfactory outcome of such tests or analysis shall in no way limit, dilute or interfere with the absolute right of the Engineer to reject the whole or part of such materials supplied, which in the judgement of the inspecting authority does not comply with the conditions of the contract. The decision of the Engineer in this regard shall be final, binding and conclusive for all purposes.

The test shall be carried out by the Contractor, for which Contractor shall provide all facilities including supply of labour and plant. Engineer may at his/her discretion direct the Contractor to despatch such tests pieces as he/she may require to the National Test House or elsewhere as he/she may think fit for such testing purposes. The Engineer may at his/her discretion, check test results obtained at Contractor's work by independent tests at NABL accredited Laboratory.

#### **13.5 Packing:**

All projecting plates or bars shall be kept in shape by timber or angle bars spiked or bolted to them and the ends of chord lengths, end posts etc at their shipping joints shall be protected and stiffened so as to prevent damage or distortion in transit as the Engineer may direct. All threaded ends and machined surfaces are to be efficiently protected against damage in transit. The parts shall be transported in convenient lengths. All straight bars and plates except small pieces are to be transported in convenient bundles temporarily riveted or bolted together or bound with wrought iron or suitable wire as the Engineer may direct. All bolts, nuts, washers, plates under 300mm square and small articles generally are to be packed separately for each span. HSFG & other temporary Bolts of different sizes shall be separately packed in bags, each bag having a label indicating its contents. A list of contents shall be placed on top of each case or cask.

#### **13.6 Fabrication:**

##### **13.6.1 General:**

The fabrication of the girder and its accessories shall be carried out by the contractor in a workshop which is in the approved vendor list of RDSO for 'Steel Bridge Girder' or in a site workshop duly approved by RDSO. The workshop staff shall have requisite experience, proven skill and experience in the technique of fabricating large components. Accuracy of fabrication shall be realized through

controlled high precision jigs, fixtures and templates, which shall be inspected and passed by Engineer specifically approved in prior by Engineer-In-Charge. The fabrication shall be preceded by Quality Assurance plans to be submitted by the contractor and every activity shall be documented in detail. The Quality Assurance Plans shall clearly indicate how individual processes such as cutting of raw steel, making, drilling, assembly bolting, welding, painting, handling etc. shall be monitored for quality. The quality parameters for monitoring shall be identified. These identified quality parameters shall also be specified in these quality plans. The contractor shall get these quality plans approved from Engineer before start of fabrication work. The Engineer shall be empowered to check the manufacturing process from time to time to ensure that the work is executed as per approved quality plans. The quality records shall be submitted to Engineer for record, after completion of fabrication work. The works of fabrication in contractor's fabrication shop will at all times be open for inspection by Engineer / agency as nominated by Engineer. Before dispatch of fabricated steel work from the shops, the same will be inspected in the contractor's fabrication workshop by Engineer who will thereafter issue inspection certificate. Any defect noticed during inspection in the execution of work shall be rectified or replaced by the contractor at his own cost. The decision of Engineer or any other agency nominated for inspection as to be rectified or replaced, shall be final and conclusive.

#### **13.6.2 Fabrication Drawings:**

The contractor shall prepare detailed shop drawings including drawing office dispatch lists on the basis of design drawings approved by Engineer in such size and in such details as may be specified by Engineer. The shop drawings shall be submitted to Engineer in triplicate. No work of fabrication will be started without such approval being obtained. Contractor has to arrange the proof checking of the working fabrication drawings from the nominated Institution / Consultant. The cost of the same will be borne by the contractor. Nomination of the Institution/Consultant for proof checking works will be decided by Maha-Metro. Engineer will make all efforts to approve the drawings submitted by the contractor within reasonable time but no claim from contractor for any delay on this account shall be entertained by Engineer. For Engineer's use and record, the contractor shall supply free of charge, four sets of prints on string paper and one set of neatly executed tracings of all approved detailed drawings and fabrication drawings, soon after communication of approval for use at site.

#### **13.6.6 Maintenance of records by Fabricators:**

During fabrication as per approved QAP, stage wise records to be maintained by the fabricator which can ascertain the approved raw material and consumables, approved welding consumables, approved welders, approved set of jigs are being used. The Engineer or his nominated agency shall check all such records and necessary sign/certification should be done during fabrication at regular intervals. On completion of the work, fabricator should handover the original copy of such record to the Engineer.

The records of fabrication shall be maintained by the fabricator in the registers such as Jigs register, HSFG bolt checking register, Material offering and inspection register, RDSO / Inspecting Agency inspection notes and compliance register, Welding procedure data register, Radio-graphic inspection register and

Statement of material test certificates, etc. The formats are given in Appendix I of IRS B1 – 2001. Inspections will be carried out by the agency/official nominated by Maha-Metro.

#### **13.6.4 Tolerance in Fabrication:**

Fabrication tolerance shall be as stipulated in Appendix II of IRS-B1– 2001. All members of the girder and joints are to be either welded or bolted as shown in the approved structural drawings. No welding except where approved by the Engineer is to be carried out at site. All welding and bolting are to be carried out as per relevant IRS Specifications.

#### **13.6.5 Method of fabrication:**

The Contractor shall submit the detailed method statement of fabrication, conforming to IRS: B1-2001 (with up-to-date correction slip) unless otherwise specified in these specification, for the approval of Engineer-In-Charge. The method statement of fabrication shall consist of but not limited to Flattening and Straightening, Planning and Shearing, Flame/CNC Plasma Cutting, Drilling and Sub-punching, Tack Assembly, Temporary Bolts, Nuts & Washers, Welding operation, Sequence of welding and welding pass, Welding Procedure Specification Sheet (WPSS), Welding Procedure Qualification Records (WPQR), and Painting operation. No work of fabrication shall be started without such approval being obtained.

#### **13.6.6 Shear Studs/Shear Connectors:**

Shear Studs/Connectors specifications, Testing& Installations shall conform to Guidelines for Composite Construction Including Stud Shear Connectors Report No BS-115 (Revision 1) April 2016, unless otherwise specified in this specification.

The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above. The rate for Shear Stud/Connector is included in the respective item for girder fabrication, so no separate payment for this item will be made.

#### **13.6.7 HSFG Bolts:**

HSFG bolts specifications, Testing & Installation shall conform to Guidelines for use of High Strength Friction Grip (HSFG) bolts on bridges on Indian Railways Report no BS-111 (Revision 5), unless otherwise specified in this specification. Contractor has to provide DTI washer in case HSFG bolts is specified to be used in the approved drawing.

The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above. The rate for HSFG Bolts is included in the respective item for girder fabrication, so no separate payment for this item will be made.

#### **13.6.8 Camber:**

When supported on blocks or staging, the girders shall be erected to the camber specified in the fabrication drawings according to which the girders have been manufactured.

Camber shall be checked while the girder is supported on the nodal points on camber jacks and after releasing jacks i.e. for residual camber with girder resting on bearing ends. The camber measurements should be done with appropriate levelling instrument.

Frequent checks shall be made of the camber of girders during erection and care taken to see that the camber as per drawing is obtained when the girder is completely assembled. When span is supported on ends and intermediate supports are removed the dead load camber shall be recorded and entered in bridge register. This will provide the reference to compare the camber checked during technical inspection to ascertain the loss of camber.

#### **13.6.9 Care during Assembly at Workshop:**

All components shall be offered for inspection prior to painting. All approved components shall be stamped defect free, painted as per specifications prior to dispatch to bridge site. On final finishing of each component, it shall be marked distinctly with paint with shipping mark for guidance, during assembly of component.

The appearance test and test to check the fixing of shear studs shall be as per IRS BS-115.

#### **13.6.10 Trial Assembly:**

The contractor is required to undertake test assembly of the girders, before painting, in his fabrication workshop to prove accuracy of templates and Jigs. This assembly can be done in horizontal position. The test assembly shall be certified by the Inspecting agency of the Engineer. Every span is to be temporarily erected complete in Fabricator's workshop for Engineer's Inspection before dispatch and all parts as marked to their place. Any defect noticed during inspection in the execution of work shall be rectified or replaced by the contractor at his own cost. The decision of Engineer or any other agency nominated for inspection as to be rectified or replaced, shall be final and conclusive.

#### **13.6.11 Painting:**

Specification for surface preparation, metalizing and painting shall be done as per Clause no. 39.2.1 of Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001). All approved components shall be stamped defect free, painted as per specifications prior to dispatch to bridge site. On final finishing of each component, it shall be marked distinctly with paint with shipping mark for guidance, during assembly of component.

##### **13.6.11.1 Paints: Source & Quality:**

Paint and other accessories including those for metallising work will be supplied by the contractor from the manufacturer's in the approved list of RDSO and final approval by the Engineer. The contractor shall furnish to the Engineer, the date of manufacture of paint as certified by the manufacturers with the necessary container marking and test certificate for paint conforming to relevant IS code. In addition to this, he shall also submit the necessary vouchers in respect of paint purchased by him. The Engineer reserves the right to get the paint tested at contractor's expenses as considered necessary

by the Engineer. If the test results do not conform to relevant IS specifications fully, then the lot of paint shall be rejected and got removed from the contractor(s) storage. If the paint has already been applied it shall be removed.

In addition to above, the following tests are required to be carried out in the field.

- Weight per litre
- Consistency test - Scratch test.
- Flexibility and adhesive test.

The Engineer reserves the right to reject the lot of paint even on the basis of field results.

### **13.7 Transports from Workshop & Stacking at Site:**

All items fabricated in the workshop shall be marked and packaged with accompanying package list. The items after fabrication shall be transported by contractor to site by Rail/Road in a manner as to cause no damage to the components. Contractor shall be liable for all losses and damages in transit for the materials consigned by him till materials are erected and work completed and taken over by the Engineer. Insurance against loss or damage in transit, if any, shall be the responsibility of the contractor.

After identification & correct marking, all components of each girder shall be dismantled & similar components shall be grouped together & labelled; bolts and plates of each size shall be packed separately, after approval by the Engineer. The packages shall be of such size by length & weight that they are safely transportable by Rail/Road. The components shall be provided with necessary packing to avoid damage to painting & members in transit. Dimensions for transport shall be as per standard schedules.

### **13.8 ASSEMBLEY & ERECTION:**

#### **13.8.1 General:**

The contractor shall provide at his own cost all tools, machinery, equipment and erection material, including all temporary works and shall assemble all components in every respect as stipulated in the contract and in accordance with approved drawings and specifications.

Before starting the work the contractor shall seek the Engineer's approval as to the method he proposes to follow and the type and suitability of equipment he proposes to use for assembly of girder components and launching of girder. The approval of the Engineer shall however not in any way relieve the contractor of the responsibility for the adequacy and safety of methods and/or equipments he proposes to use for carrying out work in full accordance with drawings and specifications.

All temporary work shall be properly designed and substantially constructed for the loads, which it will be called upon to support. Adequate allowance and provision of lateral forces and wind loads shall be made according to local conditions and ensure that support shall not settle during erection. Temporary bracing shall be provided to take care of stresses caused by erection equipment or other incidental loads during erection. The method use for lifting and slinging flexible members shall be brought to the notice of the Engineer and shall be subject to his approval. The contractor shall observe sufficient accuracy in the assembly of every part of the work to ensure that all parts fit accurately together.

**13.8.2 Assembly at site:**

**Cleaning of permanent contact surfaces:-** Surfaces which will have permanent contact shall be removed of paints and mill scale down to bare metal, clean and dried and immediately a coating of zinc chrome red oxide priming to IS:2074 shall be applied. Care shall be taken to see that all burrs are removed, and no surface defects exist before the parts are assembled. They shall be painted immediately before assembly with one coat of suitable primer and raw linseed oil freshly ground and the surface prepared for painting as per painting specification at Clause 2.5.38.

**Reaming:-**No reaming shall be undertaken without the written authority of Engineer or his authorized representative except for under drilled holes meant for turned bolts. The contractor shall supply special bolts to fill reamed hole, where reaming is approved. Record of all such variations shall be kept. However, these provisions should not apply for under drilled holes meant for turned bolts. Copies of all correspondence pertaining to the recourse of reaming and the use of oversize bolts shall be sent by the contractor for information to Engineer.

**13.8.3 Requirement of Traffic blocks/OHE Power Blocks for works adjacent to Live Railways:**

- i. The contractor shall obtain Power / Traffic / Shut down in the name of authorized representative of Maha-Metro. Maha-Metro/Engineer will facilitate to make arrangements to obtain power blocks / shutdown (hereinafter referred to as blocks) for works to be carried out along or adjacent to the track work. Works such as foundations of abutments/piers shall generally be done without blocks. However, if block is required due to safety considerations, the construction shall be done under block. The requirement of shut down, power blocks etc. shall be assessed by the contractor and will be submitted to the Engineer/Engineer's representative. All the erection of girders etc. shall be done under minimum power block/shut down.
- ii. The Contractor shall confirm that he will equip himself to carry out all construction during night blocks efficiently by suitable special lighting equipment without any extra cost.
- iii. Block period shall be counted from the time the TR-line is placed at the Contractors disposal at the work-spot till it is cleared by the Contractor.
- iv. Any charges which may be levied by Indian Railway on account of "Possessions of Traffic/OHE Blocks" shall be payable by the Employer. However, penalties, if any, levied by Indian Railways caused due to any careless working or otherwise of violation of the Terms and Conditions of the track block, shall be payable by the contractor.
- v. The contractor shall not be entitled to any extra payment due to hindrance resulting from normal Railway operations, such as delay on account of adequate number of, and duration of blocks not being granted.
- vi. Additional 100% (or as directed by Indian Railways) reserve/standby cranes, machineries, tools and plants shall also be made available by the contractor in advance of work, to cater for any failure/ eventualities during the launching operation. The cost of the same is included in the respective item for girder fabrication, so no separate payment for this item will be made.
- vii. **Safety Measures during Traffic/Power block:** Contractor shall conform that provision of IRPWM, Railway Board Instructions and general instructions under Sub-Clause 37 of SHE manual related to block protection, safety precaution of work must be followed. The contractor shall abide by all Railway regulations in force for the time being and ensure that the same are followed by his representatives, Agents or sub-contractors or workmen. Nothing extra shall be payable on this account.

- viii. The employer shall remain indemnified by the contractor in the event of any accident occurring in the normal course of work, arising out of the failure of contractor or his men to exercise reasonable precaution at all places of work.

#### **13.8.4 Erection of Open Web Girder Span:**

##### **13.8.4.1 General:**

Once sufficient number of girders are assembled and the sub-structure has been certified to be ready, launching of girders shall be taken up. The launching/erection of girders shall be done as per approved drawings. For this purpose, the contractor shall submit in triplicate, detailed launching schemes of all the girders including design calculations, safety procedures and method statement with such plans, sketches and other details as may be necessary to determine the suitability and adequacy of the schemes proposed. The scheme will be checked by Engineer/Maha-Metro. After approval of Engineer-In-Charge, the contractor must also obtain the approval for Launching/Erection scheme by Indian Railways and any statutory clearances such as CRS sanction. Maha Metro will only facilitate the contractor for getting the necessary approval from concerned regulatory authorities. Contractor will be responsible for getting approval of launching scheme submitted by him. No work of Erection/Launching shall be started without such approval being obtained.

The contractor shall provide full structural details of the temporary members and their connections to the girder, along with necessary design calculations not only justifying member's sizes but also for the entire launching system adopted. The methods adopted shall not, under any circumstances, cause the stresses in various members of girder spans to exceed permissible and safe limits at any stage of launching. One copy duly approved by the Engineer shall be returned to the contractor.

The launching system shall be test tried, if directed by the Engineer, and no separate payment for this shall be made. Nothing extra will be paid to the contractor for adopting any scheme for launching. All temporary members shall be removed after launching and may be taken back by the contractor.

##### **13.8.4.2 Temporary Strengthening:**

The launching arrangement may include fabrication of launching nose or restraining girders, sway restraining devices such as sway ropes, restraining cables etc. the supply and fixing of members for temporary strengthening of girder members to take care of erection stresses and strains and other relevant components for satisfactory and successful completion of the defined scope of work. Erection stresses must be kept within safe and permissible limits at every stage of erection.

The contractor has to make arrangements at his own cost for the steel for temporary arrangements including fabrication of launching nose, sway restraining devices for launching and temporary strengthening of girder, as may be required for the launching operations. The rate quoted should take into account these factors as nothing extra shall be paid.

##### **13.8.4.3 Inspection and Rectification:**

During erection of girders, the contractor shall provide all facilities and permit the Engineer to inspect the field assembly, site bolting and erection of spans. After inspection by the Engineer, the contractor shall identify cause of any defect, imperfection and/or fault noticed during such inspection and initiate corrective action as per the direction of the Engineer. All defects, imperfections of faults for which the contractor is liable under the contract, shall be made good by the contractor to Engineer's satisfaction and the cost of identifying and rectifying such defects, imperfection or faults shall be borne by the contractor.

#### **13.8.4.4 Commencement of the Erection Work at site:**

The contractor shall commence the erection work when and as soon as, but not until, he receives instructions from Engineer to do so. On such order being given, possession of site/authority shall be given to the contractor of such portion or portions of the site as the Engineer may determine.

#### **13.8.4.5 Contractor's Liability:**

Any fitting, accessory or apparatus which may not have been mentioned in this specification or the drawings, but which are usual or necessary in the execution of such work, are to be provided by the Contractor without extra payment. The whole work must be completed in all details, whether mentioned in this specification or not, with the exception of such work as has been specified in the schedule of items to be separately provided for in the Contract.

Notwithstanding the specifications and conditions stated in the contract, the contractor shall keep the Engineer/ Employer authority fully indemnified and free from all liabilities and risks consequential to any lapse on his part in respect of material quality, standard of workmanship, accuracy of fabrication and the like. He shall provide all labour and material required for execution of the work as per all standards and specifications.

### **13.9 Quality Assurance:**

#### **13.9.1 Quality Assurance Plan (QAP):**

The Contractor has to submit the Quality Assurance Plan (QAP), in line with Standard QAP for the Open Web Girder (OWG) as per Annexure-I of RDSO's BS-125, for the scrutiny and approval of the Engineer-In-Charge. The contractor should ensure that work is carried out strictly as per the approved QAP and no deviation takes place from QAP.

#### **13.9.2 Raw Material:**

Passing of raw material is done on the basis of visual inspection and lab test, as per approved QAP, for mechanical properties, chemical composition, ultrasonic examination, Charpy Impact Test, lab test report etc. HSFG Bolts, Shear Studs and other consumables like paint, welding rods etc. should also be got tested from NABL Lab as per relevant codes/specification.

All the required test should be got done through independent NABL Labs and compared with the mill test results given by the supplier before passing the material for use. Material test certificate register must be maintained by



fabricator as per Annexure available in IRS: B1-2001(appendix-I, Performa-7) and signed by Inspecting agency/Engineer as well as fabricator.

In addition to above visual inspection shall be done to ensure that steel is free from surface defects like pitting, lamination, imperfect edges, twist, other harmful defects etc. and recorded in the register.

### 13.9.3 Inspection of Open Web Girders (OWG):

The standard stages of inspection for Open Web Girders (OWG) is detailed below:

(I)	Prefabrication stage :	Inspection/ Approval
	(1) Approval of Quality Assurance Plan (QAP)	Engineer/Maha-Metro
	(2) Scrutiny of Welding Procedure Specifications Sheets (WPSS)	Engineer/Maha-Metro
	(3) Welders Qualification Test i.e. Welding Procedure Qualification Records (WPQR)	Engineer/Maha-Metro
	(4) Inspection and clearance of raw material	Engineer/Maha-Metro
	(5) Inspection of layout on template floor (Nominal Camber)	Engineer/Maha-Metro
	(6) Inspection of jigs and fixtures with master plates	Engineer/Maha-Metro
(II)	During Fabrication :	
	(1) Use of approved raw material	Engineer/Maha-Metro
	(2) Use of approved welding consumables	Engineer/Maha-Metro
	(3) Use of approved welders	Engineer/Maha-Metro
	(4) Use of approved welding procedures and parameters (WPDS) Welding Procedure Data Sheet to be maintained for all welds.	Engineer/Maha-Metro
	(5) Fabrication with approved set of jigs	Engineer/Maha-Metro
(III)	After Fabrication :	
	(1) Inspection of welds	Engineer/Maha-Metro
	(2) Structural and dimensional inspection	Engineer/Maha-Metro
	(3) Trial assembly (First Girder)- Camber Values, Dimensions, Fairness of Holes by Go-No-Go Gauge, Butting of Flange in Top Chord.	Engineer/Maha-Metro
	(4) Inspection of Dismantled Components of 1 <sup>st</sup> Trial Assembly – Check for elongation of Holes/Abnormal stress marks/cuts etc. & Removal of shortcomings noted during Trial Assembly.	Engineer/Maha-Metro
	(5) Inspect of only components for further spans- welding inspection & Dimensional checks.	Engineer/Maha-Metro
	(6) Metalizing/ Painting	Engineer/Maha-Metro

**Note:** The Contractor has to arrange all the facilities viz. transportation, lodging, assisting inspection etc. for the Engineer/Maha-Metro to carry-out the inspections during all the stages mentioned above at his own cost. Nothing extra shall be payable regarding this.

### 2.20 Measurement and Payment (Not applicable for Schedule B)

For the purpose of payment, quoted rates apply to the weights of structural steel work calculated from final working drawings based on theoretical weights as specified on the approved drawings, no deductions being made for skew cuts, holes or notches. Each gusset shall be measured as equivalent to the dimension of the smallest

enclosing rectangle. The rates items quoted by the tenderer shall include all wastage. The wastage of steel in the form of skew cuts etc shall be the property of the contractor.

The payment for steel work as per item in the schedule of items shall be released in stages of accepted item rates for quantities executed, as mentioned in the tender schedule. The payment after receipt of material in fabrication shop shall be made on the basis of measurements contained in the supplier's vouchers, if required, these measurements shall be further verified by the representative of Engineer in charge by measuring dimensions/sizes of the sections and multiplying the same by standard weight. Sampling for actual weight of the sections shall also be done by him as per procedure and frequency prescribed by Engineer.

No separate payment shall be made for the field bolts, nuts and service accessories for temporary works.

The cost of temporary erection and testing at the Contractor's workshop, marking, packing and delivery at the site of work is to be included in the price quoted on the tender. Rate include fabrication of all the types of battens, bracings, ties, stiffeners, packing, diaphragms, shop bolts / welding, T&F bolts, drifts, shop welds, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, lift and taxes complete including assembly of girders .

Rate of girder item includes assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position and lowering of girder on bearings.

Grouting of holes with approved epoxy-based compounds in the bed block for fixing of HD bolts/anchor pins of bed plates as directed by Engineer are included in the bearing rates.

#### **13.10 Bearing:**

The detailed specification for bearing and it's installation is provided in the section S.10. Bearings shall be provided before concreting of deck slab is taken up.

Bearings shall be protected during concreting or providing holding down bolts operations. Any mortar or foreign material contaminating the bearing shall be completely removed.

#### **13.11 Deflection Tests:**

The deflection test shall be carried out as per relevant Indian standard or as specified in the specifications. No extra shall be paid for the Load testing.

**S.14: SPHERICAL BEARINGS**

The term “bearing” in this case refers to a spherical bearing consists of a pair of matching concave and convex steel spherical backing plates with a low friction sliding interface in between thereby permitting rotation by in-curve sliding. The bearing shall cater for translation and/or rotation of the superstructure.

**14.1. Scope of Work**

The scope of work will include:

- i) Rendering necessary assistance/coordinate with the manufacturer with regard to placement/fixing of said bearings. The contractor shall ensure that these bearings are installed in accordance with the specification mentioned in these documents and approved method statement, so that the bearings perform in the desired manner, in accordance with the forces/ displacements/ rotations for which these bearings have been designed.
- ii) The contractor shall liaise with the agency and will be responsible for design etc.
- iii) The contractor shall furnish adequate and proper installation details for these bearings while submitting his design and detailed Engineering Drawings.
- iv) The design criteria, specifications etc. as mentioned in tender documents are mandatory and no deviation to the same shall be permitted unless otherwise directed by the Engineer.
- v) The contractor shall supply all the bearings in suitable packed condition (for its proper transportation and storage before placement in position) at project site to be identified by the Engineer.
- vi) Scope for lifting the superstructure for future replacement of bearings shall be provided for in the design of bearing. The scheme of lifting shall be indicated on the drawing to be submitted at the time of approval.
- vii) When requested by the engineer, the Contractor shall submit test certificates from the approved, independent testing authority to show that the respective materials comply with the specified requirements, or a certificate from the patent holder or designer certifying that the manufactured item complies in all respects with relevant product specifications.
- viii) The bearings shall be fabricated from only new and unused materials. Reclaimed materials are not acceptable.

**14.2. Design**

Design of the bearing and all accessories shall be the responsibility of the Contractor and got approved from the Employer's Representative.

Design of the Spherical Bearings shall confirm to the provisions of the Employer's requirement – Design and General planning criteria of this tender document.

The design, drawings and detailed method statements for installation and replaceability of the bearings shall be checked and certified by approved independent agency before submitting to the Engineer for approval.

**14.3. Material Specifications**

- i. All the materials to be used in Spherical Bearings shall confirm to clause No. 4 Materials of IRC 83: Part-IV 2014.
- ii. Steel for bearing main components shall be cast steel in accordance with IS: 1030 Grade 340-570W except for calotte which shall be only fine grain rolled steel conforming to IS:2062 Grade E 350 or above.

- iii. Equivalent or superior grades as per other national and international specification with proven performance and suitability to application requirements may also be acceptable, subject to the approval of Engineer-In-Charge.
- iv. Positive anchoring arrangement by way of Bolts passing through Bearing component and anchored to Dowels/Steel distribution plates shall be adopted for all Bearings. Bolts to be used for anchoring of the Bearings shall be of property class 8.8 or 10.9 in accordance with IS: 1367. Steel for Dowels shall be rolled steel in accordance with IS:2062 Grade E250 min. The anchor bolts and washers shall be galvanized.
- v. The corrosion protection of the exposed steel surfaces including backing, intermediate plates and welding zone etc. shall be achieved by a protective coating system in accordance with the Clause 4.10 of IRC-83-IV.
- vi. Low Friction Thermo-Plastic sliding material made of UHMWPE - Ultra high molecular weight polyethylene conforming to the provisions of IRC-83-IV, is only permitted for use as main sliding surface.
- vii. The entire curved surface of the convex steel plate mating with concave sliding surface shall be hard chromium plated only and conforming to the provisions of IRC-83-IV.
- viii. Silicone grease shall be used as lubricant for sliding surfaces. Physical and Chemical properties of silicon grease shall be as per Clause No.4.8 of IRC 83 Part-IV.
- ix. Care shall be taken to ensure that the adhesive is applied uniformly over the entire surface of the sliding material so as not to cause an uneven sliding surface that could lead to premature wear.

#### **14.4. Manufacturing of Spherical Bearings**

##### **A. General**

- i. Manufacturing of Spherical Bearings shall comply with Clause No.6 of IRC 83 Part-IV 2014.
- ii. The Contractor shall submit the Design & Fabrication drawings for the approval of Engineer at least 30 days prior to the start of bearing fabrication. This notification shall include all of the information shown on the shop drawings which are required as explained in subsequent section.
- iii. Protection against Corrosion and Contamination: Shall conform to the provisions of Clause 6.9 of IRC-83-IV.
- iv. Manufacturing of Bearing shall be commenced only after the approval of Design and Fabrication drawings by the Engineer.
- v. Movement indicators shall be provided for bearing with sliding assembly to facilitate routine inspection during service period.

##### **B. Shop Drawings**

The Contractor shall submit shop drawings to the engineer for approval which shall include, but not limited to, the following information:

- i. Erection drawings, plan, elevations and complete details and sections showing all materials incorporated in the bearings.
- ii. Bearing pre-set details, if applicable.
- iii. Protective coating requirements.
- iv. A table containing maximum and minimum vertical and horizontal loads, design rotation requirements, and magnitudes and directions of movements.
- v. Bearing seat and all bearing connection and anchorage details.
- vi. Any special consideration such as earthquake requirements, uplift details, or temporary attachments.
- vii. The location of the top and bottom bearing adapter plates drawn in plan and in elevation on the deck soffit and on the support structures showing edge distances.

- viii. The bearing orientation (uni and multi directional bearings) with respect to the direction of Bridge / traffic movement.
- ix. The drawings and design calculations shall be duly signed & stamped by company seal.
- x.

**C. Manufacturing Tolerances**

- i. Manufacture tolerance shall conform to clause No.6 of IRC: 83 Part-IV.
- ii. All these measurements were taken using dial height gauges, vernier calliper, surface finish measurement instrument etc has to be arranged by manufacturer at the workshop.

**14.5. Inspection and Acceptance Specification:**

- i. Bearings shall be manufactured to high standards both in terms of material quality and workmanship. The manufacturer shall have requisite load test and NDT facilities required for process and acceptance control tests installed at his plant. The test facilities and their operation shall be open for inspection. For confirmatory tests on raw materials, tests shall be conducted at in-house facility of the manufacturer or at NABL accredited laboratory.
- ii. **Manufacturer's Internal Testing:** Shall comply with clause No. 7.3 of IRC 83-Part-IV 2014.
- iii. **Lot Classification:** Shall comply with clause No. 7.2 of IRC 83-Part-IV 2014.
- iv. **Acceptance Test by Inspecting Authority/Engineer:** Shall comply with clause No 7.4& 7.5 of IRC 83-Part-IV 2014. Acceptance testing shall commence with the prior submittal of testing program in form of Inspection and Test Plan (ITP) prepared by the manufacturer and approved by concerned authority, to the Engineer.
- v. **Inspection Report:** The details of the tests and inspection carried out both in house and in the presence of the Engineer shall be recorded in the standard testing formats along with their observations. These filled up formats along with the raw material test certificates, reports of the tests done in process e.g. welding (DPT), hard chromium plating (Ferroxyl Test), mating surface hardness test, ultrasonic test, S/S surface finish and Paint DPT etc. shall be compiled and submitted to the Inspecting/Acceptance Authority/Engineer as Test Reports.
- vi. **Certification:** The approving/accepting authority/Engineer after getting satisfied with the Quality of the Product manufactured shall issue Certificate of conformity of the product stating the conformity with the provisions of this Specification and clearance to the Manufacturer to effect the shipment of the Bearings to the job site.

**14.6. Storage, Transportation and Handling:**

**A. Marking:**

- a. Movement indicators shall be provided for bearing with sliding assembly to facilitate routine inspection during service period.
- b. All Bearings shall have suitable identification plates permanently affixed which shall be visible after installation, identifying the following information: -
  - i. Name of Manufacturer
  - ii. Month and Last two digits of the year in which the Bearing manufacturer(mm/yy)
  - iii. Serial Number of the Bearing

- iv. Bearing Designation and Type
  - v. Design Performance parameters viz. Load, Movement etc.
- c. Besides this, the Bearing Top Surface shall also be marked with the following information to facilitate their correct installation at site:
- i. Centerline Marking
  - ii. Bearing Designation and Type –
  - iii. Orientation Marking to facilitate correct placement on the Pedestal
  - iv. Direction of Major and Minor movement, as appropriate
  - v. Preset Marking, if applicable.
  - vi. -Location Number upon each support (If required)

**B. Packaging, Transport and Storage:** All the provisions of clause No.8 of IRC 83-Part-IV shall be complied.

#### **14.7. Installation of Bearing:**

- i. Install bearings in the structure as specified and shown on the drawings and directed by the bearing supplier. Installation procedure shall be subject to review and approval of the Method Statement by the engineer.
- ii. Bearing Installation Work shall be commenced only after the approval of Method Statement by the Engineer.
- iii. The manufacturer will have its technical representative present for the placement of the first few bearings unless the contractor gains confidence about the installation of the remaining Bearings.
- iv. At the instructions of the engineer, option of the manufacturer or the design engineer, the technical representative may be required to be present for the placement of any number of additional bearings.
- v. **Aspects Related to Bearing Performance and Installation:** Shall conform to the clause 9 of IRC:83-IV.
- vi. Bearings shall be set to the dimensions and offsets conforming to the requirements mentioned in the IRC:83-IV and the approved drawings.
- vii. When placed, bearings shall be dry, clean, and free from dirt, oil, grease, or other foreign substances.
- viii. They shall be adjusted as necessary to take into account the temperature at time of installation and future movements of the bridge due to temperature changes, release of false work and shortening due to prestressing.
- ix. Under no circumstances shall bearings be taken apart and reassembled on the site, except where it is an unavoidable feature, in which case the dismantling, installation and reassembly shall be under the supervision of the Manufacturer or his agent.
- x. Care shall be taken to ensure that no air pockets exist below the bearing bottom adapter plate after installation.
- xi. The bedding material i.e. High strength Non-Shrinkage Epoxy Mortar shall be capable of transmitting the applied load to the structure without damage. The cost of this epoxy mortar is included in the scope/BOQ Item and nothing extra is payable regarding this.
- xii. The bedding material thickness shall not be less than 20 mm.
- xiii. The bedding material shall extend beyond the bearing perimeter by at least 50 mm or twice the thickness of the bedding mortar; whichever is greater.
- xiv. Fall away (slope) the top surface of this bedding material extension from the bearing to prevent the collection of water around the bearing.
- xv. After installation leave bearings and their surrounding area clean. Remove temporary transit clamps at a time to be agreed upon by the supplier and the Consultant.

- xvi. Voids or hard spots after installation are not acceptable.
- xvii. Tighten threaded fixings uniformly to avoid overstressing any part of the bearing.
- xviii. Agree to the position of any temporary packing between the outer bearing plates and the structure with the Consultant.

#### **14.8. Documentation to be Supplied with the Bearing:**

The Contractor shall provide all necessary documentation for the long-term inspection, maintenance, and replacement of the bearings.

This shall include full documentation of the design, working drawings, a certificate of compliance from the supplier, third party testing certificates, welding certificates, documentation of the load tests, quality records and as installed details, procedures for the inspection of the bearing, procedures for maintenance and a fully detailed method statement for the replacement of the bearings.

#### **14.9. GUARANTEE**

- i. The Contractor is to provide a written guarantee stating that the bearings have been fabricated such that they will perform satisfactorily within the design range of movement and under the design loads for a period of fifty years from the date of supply.
- ii. The Contractor shall indicate that they have reviewed the installation procedures and find it in accordance with the bearing recommendations.
- iii. Provide in the guarantee for the replacement (including supply and installation) of the bearing components or the bearing as a whole at no cost to the Owner in the event that the bearings do not perform satisfactorily within the design range of movement and under the design loads.
- iv. The Contractor shall submit from the bearings manufacturer the bearing technical approval document for Spherical Bearings with Special Sliding Material issued by MPA Stuttgart or equivalent approval bodies, which will indicate that the Manufacturer / their technology partner is allowed to design & produce the Bearings utilizing the special sliding material (MSM / UHMWPE) up to a diameter of 2500 mm and that the working / service life of the bearing shall not be not less than 50 years.
- v. Manufacturing or sourcing of the raw material or finished components of the Bearings or the Bearing as a whole from China is not permitted.

#### **14.10. Measurement and Payment (Not applicable for Viaduct Lumpsum scope – Schedule-B)**

- i. The bearings shall be measured and paid for per unit at the relevant price entered in the Bill of Quantities.
- ii. The tendered rate shall include full compensation for all engineering, labour, design, fabrication, installation and equipment necessary to complete the work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided. Payment shall include supply of all materials, protection system, dust cover, all necessary bedding, anchor bolts, jacking plates (if required) and temporary works, etc., and shall include shop drawings, quality control, testing, supply and installation, storage, shipping and delivery.

**ANNEXURE- VII- 3****APPENDICES**

<b>Sl.No</b>	<b>Reference</b>	<b>Description</b>
1	Appendix 1	Drawing list
2	Appendix 2A	Work Areas
3	Appendix 2B	Key dates and Completion
4	Appendix 2C	Site office and Mobility
5	Appendix 2D	Deleted
6	Appendix 3	Project calendar
7	Appendix 4	Program requirements
8	Appendix 5	Monthly progress report
9	Appendix 6	Quality assurance
10	Appendix 7	Draughting and CAD standards
11	Appendix 8	work areas and temp power supply
12	Appendix 9	Deleted
13	Appendix 10 A	Approved manufactures and supplier (Civil)
14	Appendix 10 B	approved manufactures and supplier (MEP and Plumbing)
15	Appendix 11	Curves and gradient details
16	Appendix 12	Utilities-Deleted
17	Appendix 13	RAM- Deleted
18	Appendix 14	Contractor Site Laboratory
19	Appendix 15	Deleted
20	Appendix 16	Earthing and Grid-Deleted
21	Appendix 17	Foundation Detail-Deleted
22	Appendix 18	DELETED
23	Appendix 19	List of Approved Laboratories
24	Appendix 20	Extra top width of Segment in case of sharp curvature of radius less than or equal to 150m
25	Appendix 21	LOP of OHE Portals/Masts-Shall be furnished by the bidder
26	Appendix 22	Details of shear connectors for track plinth
27	Appendix 23	LOP of Signaling Posts-Shall be furnished by the bidder
28	Appendix-24	Geo Technical Investigation data
29	Appendix-25	DELETED



**EMPLOYER'S REQUIREMENTS**

**APPENDIX 1**

**DRAWING LIST**

Drawings listed and attached for guidance and general information are enclosed with tender vide Annexure -VII-9 of Part II-Work requirement.

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 2A**

**WORKS AREAS**

**WORKS AREAS**

No land shall be made available by the employer for casting yard, site offices, and site laboratories etc. Contractor shall make his own arrangements at his own cost.

**EMPLOYER'S REQUIREMENTS****APPENDIX 2B****Key dates and completion****CONTRACT KEY DATES AND COMPLETION DATE**

The Contractor shall complete all the scope of works which is stated in the Employer's Requirements within the time for completion of as stipulated in clause 8.2 of GCC/PCC, calculated from the commencement date as defined in LOA, but is not to be taken over by the Employer after completion. (Key dates will be defined later after issue of LOA)

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 2C**

**SITE OFFICE AND FACILITIES FOR THE EMPLOYER/ENGINEER**

**DELETED**

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 2D**

**DELETED**

**EMPLOYER'S REQUIREMENTS****APPENDIX 3****PROJECT CALENDAR**

1. The Project Weeks shall be commenced on a Monday. A day shall be deemed to commence at 0001 hour on the morning of the day in question. Where reference is made to the completion of an activity or Milestone by a particular week, this shall mean by midnight on the Sunday of that week.
2. A 7 day week calendar shall be adopted for various (Work) program schedules for scheduling purposes.
3. For Project purposes, the presentation shall be in 'Week' units.

**EMPLOYER'S REQUIREMENTS****APPENDIX 4****PROGRAMME REQUIREMENTS****1. GENERAL****(1) Purpose of Programme**

There are two primary purposes for the requirement of Programme (Scheduling) information described in this document:

- a. Evaluation of Tender
- b. Status Reports during Construction

To provide the Engineer with status reports for managing, monitoring and coordinating the awarded contracts during their execution within the overall multi-contract project schedule.

The requirements are organized in two stages. The first stage is a requirement for all Tenderers and shall be submitted as part of Tender. The second stage is a requirement of the Employer and describes a series of reports to be submitted by the Contractor to the Engineer during the execution of the contract, following the award of Contract.

- (2) The Tenderer/ Contractor shall always programme his work to meet the Key Dates stated in Annexure IX-G of part III of this document and the specified interface periods for the design and installation of the Works with those of the Designated Contractors and shall during the progress of the Works constantly monitor his progress the programmes described below.
- (3) The Tenderer/ Contractor shall include in all programmes, his work obligations towards shared access, shared Site areas and other coincident or adjacent Works Areas.
- (4) The Works Programme, and all more detailed or revised versions, shall be submitted to the Engineer in hard copy as well as soft copy for his consent in accordance with the provisions of the GCC.

**2. METHODOLOGY**

- (1) The computerized Critical Path Method (CPM) network using the Precedence Diagramming Method (PDM), has been selected by the Employer as the technique for contract management system and in co-coordinating the multi-contract project. This technique shall also be employed by the Tenderer in preparing their Tender submissions and by the Contractor in their Construction Stage submissions.
- (2) Unless otherwise agreed by the Engineer, all programmes submitted by the Contractor shall be produced using computerized Critical Path Method (CPM) Networks developed implementing the Precedence Diagramming Method (PDM) with Cost Loaded Charts and Tables.
- (3) The Contractor shall implement and use throughout the duration of the Contract, a computerized system to plan, execute, maintain and manage the planning, design, pre-construction, construction, and sub-contracts in executing the CPM scheduling by PDM. The reports, documents and data provided shall be an accurate representation of the current status of the Works and of the work remaining to be accomplished; shall provide a sound basis for identifying problems, deviations from the planned works, and for making decisions; and shall enable timely preparation of the same for presentation to the Engineer

**3. PROGRAMME MANAGEMENT SOFTWARE**

- (1) CPM programming software used shall be Primavera Project Planning (P6) Program - latest version. Any other compatible system capable of direct file interchange capability with software program used by the Employer - Primavera (P6), latest version, can be used with Engineer's consent. Scheduling software and relevant instruction manuals, licensed for use in

connection with the contract, shall be provided by the Contractor according to the Employer's specifications

- (2) The Tenderer may use a system other than Primavera but will be required to demonstrate that full electronic data transfer to Primavera is available and that the various levels of reporting and coding capabilities are at least equivalent to Primavera. Compatibility and comparable performance between Primavera and the Tenderer's proposed system shall be demonstrated in his Tender submission. Should compatibility not be demonstrated to the Employer's satisfaction, the Contractor shall utilize Primavera for development, statusing, updating and revision of all the Programmes during the duration of the Contract. Upon the Engineer's consent of a system other than Primavera, the Contractor shall supply the Engineer with an original licensed copy, including manuals and approved training of the software and any subsequent versions thereof at no extra cost.

**4. (Not Used)**

**5. POST CONTRACT AWARD**

- 5.1 The Contractor shall develop his Tender Programme into the Initial Works Programme including an outline Narrative Statement and submit within 15 days of the date of the Notice to Proceed

and its more detailed version within sixty (60) days of receiving the Engineer's consent to the proposed Initial Works Programme.

- 5.2 The first Three Month Rolling Programme shall be submitted within thirty (30) days of the date of Notice to Proceed and all subsequent editions shall accompany the Monthly Progress Report. The Monthly Progress Reports shall also include a Programme Update as described below. These programmes shall subsequently be updated as described below.

- 5.3 Following the Contractor's Initial Works Programme submission but in any case, no later than six (6) months from the date of award of contract, the contractor shall make submissions of the detailed Works Programme suitably amended to take into account the programmes of Designated Contractors. It is the Contractor's responsibility to ensure timely co-ordination with the Designated Contractors to review, revise and finalise his Initial Work Programme so as not to affect the progress of Works/ and or the works of the Designated Contractors. The resubmitted programme when approved by the Engineer shall form the Baseline Programme against which actual progress of the Contract shall be reckoned. As the work progresses, it may be necessary to update/ revise the Baseline programme, but such updating shall only be carried out with the prior consent of the Engineer or when directed by them.

- 5.4 For Initial & Detail Work Programme submission, one (1) original and six (6) copies each of the following Programmes and Reports shall be submitted to the Engineer:

- a) Programme: Baseline CPM Network
- b) Programme: Baseline Milestone based Cost Activity Schedule
- c) Baseline Schedule Report
- d) Narrative
- e) Baseline physical progress's 'S' Curve
- f) Baseline resource units.

- 5.4.1 The Engineer shall review and comment on the Contractor's programmes and information submitted under this Clause. The Engineer will confirm his consent or otherwise of the submissions within thirty (30) calendar days.

- 5.5 The Engineer shall require the Contractor to re-submit within thirty (30) calendar days if he is of the opinion that the programmes and information submitted by the Contractor is unlikely to meet the Contract key dates.

- 5.6 If in the opinion of the Engineer, any of the Contractor's revised programmes or Baseline Schedule Report is not acceptable, it shall be construed as a failure of the Contractor to meet a Milestone.



- 5.7 Notwithstanding the above, the Engineer may at any time during the course of the Contract require the Contractor to reproduce the computer-generated Baseline Schedule Report described above to reflect actual activity dates and generate schedules based upon "what if statements."

The initial computer-generated report after receiving the Engineer's consent will serve as the base against which the contract progress will be measured. Any changes to the Report reflected in subsequent Baseline Schedule Reports shall also require the Engineer's consent.

- 5.8 Failure to include any element of work required for performance of the Contract shall not relieve the Contractor from completing all works required under the Contract to achieve the original or any extended key completion date.

## **6. WORKS PROGRAMME**

- (1) The Works Programme shall show the Contractor's plan for organizing and carrying out whole of the Works.
- (2) The Works Programme shall be a computerized Critical Path Method (CPM) network developed using the Precedence Diagramming Method (PDM) and shall be present in bar chart and time-scaled network diagram format to a weekly or monthly timescale.
- (3) Tasks in the Works Programme shall be sufficiently detailed to describe activities and events that include, but are not limited to, the following:
  - (a) Key Dates,
  - (b) All physical work to be undertaken in the performance of the Contract obligations, including Temporary Works,
  - (c) The requested date for issue of any drawings or information by the Engineer,
  - (d) Incorporation of principal aspects of the Design Submission Programme,
  - (e) Procurement of major materials and the delivery and/or partial delivery date on-Site of principal items of Contractor's Equipment,
  - (f) Any off-site work such as production or pre-fabrication of components,
  - (g) Installation of temporary construction facilities,
  - (h) Interface periods with Designated Contractors or utility undertakings,
  - (i) Design, supply and/or construction activities of sub-contractors,
  - (j) Any outside influence which will or may affect the Works.
- (4) The Works Programme shall show achievement of all Key Dates.
- (5) Activity descriptions shall be unique, describing discrete elements of work. Any activity creating an imposed time or other constraint shall be fully defined by the Contractor.
- (6) The Works Programme shall be organized in a logical work-breakdown structure including work stages and phases and shall clearly indicate the critical path(s).

Each activity in the Works Programme shall be coded to indicate:

- (a) Activity ID and Activity Code.
- (b) The Engineer may request additional activity coding to the extent available without restraint to the Contractor's utilisation of the programme software. When requested, the Contractor shall add the required additional coding to the Programme. The contractor shall use additional code fields as requested to comply with the requirements and for the use of the Contractor.
- (7) Activity duration shall not exceed two (2) weeks, unless otherwise consented to by the Engineer, except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment and concrete curing. The Contractor shall submit a Programme/Project Calendar cross reference clearly indicating the allowance for holidays.
- (8) The Works Programme, in each submission, shall be accompanied by an Activity Report and a Narrative Statement as described below in both electronic { via suitable medium) and hard copy format (time scale logic diagrams in A1 size, reports in A4 size).
- (9) Activity Report shall list all activities, and events in the Works Programme, sorted by activity identification number.

The Activity Report shall include the following for each activity and event:

- (a) Activity identification number and description,
- (b) Duration expressed in Days,
- (c) Early and Late start, & Early and Late finish dates. Planned start and finish dates,
- (d) Calculated total float and free float,
- (e) Predecessor and successor(s), accompanying relationships and lead/lag duration,
- (f) Imposed time or date constraints,
- (g) Calendar.

(10) Narrative Statement

The Narrative shall be a comprehensive statement of the Contractor's plan and approach for the execution of the Works and the achievement of key dates, handover dates, submission dates and any intermediate dates. It shall incorporate outline method statements in respect of major items of work including construction sequences and primary item of plant, Construction Equipment, Temporary Works and the like. It shall fully explain the reasons for the main logic links in the Programme and include particulars of how activity duration are established. This shall include estimated quantities, production rates, hours per shift, work days per week and a listing of the major items of Construction Equipment planned for use on the project. Activities, which may be expedited by use of overtime or additional shifts, shall be identified and explained. A listing of holidays, and other special non-work days being used for the computer reports shall be included.

(11) Baseline Physical Progress 'S' Curve

The Contractor shall also submit a forecast Cumulative Physical Progress 'S' curve based on the time-phased distribution of cost in the CPM Network Logic Diagram, expressed in percentage terms. This 'S' curve shall be generated from the computerized CPM Network Logic Diagram.

(12) Baseline Resources Charts

The Contractor shall also submit a Resource Charts, generated from the Contractor's CPM Network Diagram, showing the anticipated manpower and main Construction Equipment usage during the execution of the Project.

As an additional monitoring facility, indicator resources shall be assigned to relevant activities for the major items of work. Indicator resources shall be directly allocated for excavation (cum.), piling (no.), pile cap (no, pier & pier cap(no), viaduct(RM), parapet wall(RM) concrete (cum) for station etc. Resource indicators may be input as a daily rate, expected required rate, or as an activity total in the relevant units. These are purely indicative quantities and do not form part of contract

- (13) All submissions of proposed Works Programmes subsequently, after approval of the Initial Works Programme, shall include the actual physical progress of work and forecast of the remaining work. Actual progress shall be stated in percent complete, remaining duration, and actual start and finish dates for each activity in the Works Programme.

## **7. INITIAL WORKS PROGRAMME**

- (1) The Initial Works Programme submitted as under Clause 5.1 need not include the full details given under Clause 6 above. It should be a condensed version with combined activities. The outline Narrative Statement shall be in sufficient detail to clearly show the Contractor's intention.
- (2) Within sixty (30) days of the Engineer's consent to the Initial Works Programme, the Contractor shall submit to the Engineer an expanded and more detailed version of the Initial Works Programme containing all the information and detail required under Clause 5 above.
- (3) Such submission shall make use of the Tender Programme submitted earlier but refined to include the best estimates of dates for the work of Designated Contracts which has impact on the Contractor's programme. Such programmes shall be amended subsequently to incorporate

the actual dates/ schedule of the affecting contracts. It is the Contractor's responsibility to ensure timely co-ordination with the Designated Contractors to finalize the Initial Programme, without affecting progress of the work.

#### **8. WORKS PROGRAMME REVISIONS**

- (1) The Contractor shall immediately notify the Engineer in writing of the need for any changes in the Works Programme, whether due to a change of intention or of circumstances or for any other reason. Where such proposed change affects timely completion of the Works or any other Key Date the Contractor shall within fourteen(14) days of the date of notifying the Engineer submit for the Engineer's consent its proposed revised Works Programme and accompanying Narrative Statement. The proposed revised Works Programme shall show the sequence of operations of all works related to the change and the impact of changed work or changed conditions.
- (2) If at any time the Engineer considers the actual or anticipated progress of the work reflects a significant deviation from the Works Programme, he may request the Contractor to submit a proposed revised Programme which together with an accompanying Activity Report and Narrative Statement, shall be submitted by the Contractor within fourteen (14) days after the Engineer's instruction. The proposed revised Works Programme shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions.
- (3) All activities that have negative float must be analyzed by the Contractor to identify the impact on the timely completion of the Works or on the achievement of Key Dates.

#### **9. THREE MONTH ROLLING PROGRAMME.**

- (1) The three-month rolling programme shall be an expansion of the current works programme covering sequential periods of three months. The Three-Month Rolling Programme shall provide more detail of the Contractor's plan, organization and execution of the work within these periods. In particular, the Contractor shall expand each activity planned to occur during the next three (3) month period, if necessary to a daily level of detail.
- (2) The Three-Month Rolling Programme shall be developed as a Critical Path Method (CPM) network and shall be presented in bar chart and time-scaled network diagram format. Bar charts shall be presented on an A4 and time-scaled networks diagrams on an A1 size reproducible media. Tasks in the programme shall be derivatives of and directly related to tasks in the approved Works Programme.
- (3) The Contractor shall describe the discrete work elements and work element inter- relationships necessary to complete all works and any separable parts thereof including work assigned to subcontractors.
- (4) Activity duration shall not exceed two (2) weeks unless otherwise consented to by the Engineer.
- (5) Each activity in the Three-Month Rolling Programme shall be coded, or described so as clearly to indicate the corresponding activity in the Works Programme

#### **10. THREE MONTH ROLLING PROGRAMME REVISIONS AND UPDATE**

- (1) The Three-Month Rolling Programme shall be extended forward each month as described under Clause 5(1) above. Each submission of the Three-Month Rolling Programme shall be accompanied by a Programme Analysis Report, describing actual progress to date, and the forecast for activities occurring over the next three-month period.
- (2) If the Three-Month Rolling Programme is at variance with the Works Programme, the Programme Analysis Report shall be accompanied by a supporting Narrative Statement describing the Contractor's plan for the execution of the activities to be undertaken over the three month period, including programme assumptions and methods to be employed in achieving timely completion.
- (3) The Contractor shall revise the Three-Month Rolling Programme or propose revisions of the Works Programme, or both, from time to time as may be appropriate to ensure consistency between them.

#### **11. THREE WEEK ROLLING BAR CHART SCHEDULE**

Once a week, on a day mutually agreed to by the Engineer and the Contractor, a meeting will be held to assess progress by the Contractor during the previous work week. The Contractor shall submit a construction schedule listing activities completed and in-progress from the previous week and the activities scheduled for the succeeding two weeks based on the detailed Works Programme. Copies of the schedule shall be submitted on A3 sized paper.

**12. PROJECT CALENDAR**

For the Project, the Contractor shall adopt 7 days a week calendar, identical calendar for the purpose of programming and Execution of Works. Official documents shall be transacted during 5 days week -Monday through Friday, except for National (Govt, of India) Holidays. For Project purposes, a week begins at 0001 hours on a Monday and ends at 2359 hours on a Sunday. The completion of an activity or the achievement of an event when given a week number shall be taken to mean midnight on the Sunday at the end of the numbered week. An access date or activity start date when given as a week number shall be taken to mean 0001 hours on a Monday of the Numbered week.

**13. PROGRAMMING PERSONNEL**

The Contractor shall submit, as part of its Staff Organisation Plan, the names and required information for the staff to be employed on Works Programming. The principal Works Programmer shall hold reputable professional qualifications acceptable to the engineer including at least five (5) years relevant experience in programming civil engineering works. Others in the groups shall have at least three (3) years experience in such works. The programmer shall be employed by the contractor full time on the contract until the completion or such earlier time the Engineer may give his consent.

**14. PROGRAMME AND REPORT SUBMISSIONFORMAT**

The Contractor shall submit one (1) original and six (6) copies and one (1) reproducible (for Programmes) of all submissions to the Engineer. All submissions shall be in AO, A1, A3 or A4 size, as appropriate except as may otherwise be agreed by the Engineer. In addition, the computerized programme and report shall be submitted in DVD or suitable Medium (similarly for submissions required under Clause 5.4).The format for all Programme and Report submissions shall be strictly in accordance with the format as stated herein or as requested by the Engineer.

**15. FAILURE TO SUBMIT PROGRAMME**

Failure of the Contractor to submit any programme, or any required revisions thereto within the time limits stated for acceptance by the Engineer, shall be sufficient reason for not making the relevant stage on account payment by the Engineer.

**The Contractor should actively participate in implementing 5D BIM system by MahaMetro**

**EMPLOYER'S REQUIREMENTS****APPENDIX 5****Monthly Progress Report****1. GENERAL**

- (1) The Contractor shall submit to the Engineer, a Monthly Progress Report. This Report shall be submitted by the end of each calendar month and shall account for all work actually performed from 26<sup>th</sup> day of the last month and up to and including the twenty-fifth (25<sup>th</sup>) day of the month of the submission. It shall be submitted in a format to which the Engineer shall have given his consent and shall contain sections/sub-sections.

**2. FINANCIAL STATUS**

- (1) A narrative review of all significant financial matters, and actions proposed or taken in respect to any outstanding matters.
- (2) A spread sheet summarising each activity, the budget, costs incurred during the period, costs to date, costs to go, cost forecast (total of costs to date and costs to go) and cost variance (difference between cost forecast and budget).
- (3) A spread sheet indicating the status of all payments due and made.
- (4) A report on of the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.

**3. PHYSICAL PROGRESS**

- (1) It shall describe the status of work performed, significant accomplishments, including critical items and problem areas, corrective actions taken or planned and other pertinent activities, and shall, in particular, address interface issues, problems and resolutions.
- (2) It shall include a simplified representation of progress measured in percentage terms compared with percentage planned as derived from the Works Programme.

**4. PROGRAMME UPDATE (For Entire Project)**

Programme updating shall include :

- (a) the monthly Programme Update which shall be prepared by recording actual activity completion dates and percentage of activities completed up to the twenty-fifth (25<sup>th</sup>) of the month together with estimates of remaining duration and expected activity completion based on current progress. The Programme Update shall be accompanied by an Activity Report and a Narrative Statement. The Narrative Statement shall explain the basis of the Contractor's submittal:
  - (i) Early Work and Baseline Submittals – explains determination of activity duration and describes the Contractor's approach for meeting required Key Dates as specified in the Contract.
  - (ii) Updated Detail Programme Submittals – state in narrative the Works actually completed and reflected along Critical Path in terms of days ahead or behind allowable dates. Specific requirements of narrative are:

- If the Updated Detailed Work Programme indicates an actual or potential delay to Contract Completion date or Key Dates, identify causes of delays and provide explanation of Work affected and proposed corrective action to meet Key Dates or mitigate potential delays. Identify deviation from previous month's critical path.
  - Identify by activity number and description, activities in progress and activities scheduled to be completed.
  - Discuss Variation Order Work Items, if any.
- (b) The Programme Status which shall :
- (i) show Works Programme status up to and including the current report period, display Cumulative progress to date and a forecast of remaining work.
  - (ii) be presented as a bar-chart size A3 or A4 and as a time-related logic network diagram on an A1 media, including activity listings;
- (c) the Activity Variance Analysis which shall analyse activities planned to start prior to or during the report period but not started at the end of the report period as well as activities started and/or completed in advance of the Works Programme.

#### 5. **KEY DATES STATUS**

A report on the status of all **Key dates** due to have been achieved during the month and forecasts of achievement of any missed **Key dates**, and those due in the next month.

#### 6. **THREE MONTH ROLLING PROGRAMME**

The monthly issue of the Three Month Rolling Programme.

#### 7. **PLANNING AND CO-ORDINATION**

- (1) A summary of all planning/co-ordination activities during the month and details of outstanding actions.
- (2) A schedule of all submissions and consents/approvals obtained/outstanding.

#### 8. **PROCUREMENT REPORT**

- (1) A summary of all significant procurement activities during the month, including action taken to overcome problems.
- (2) A report listing major items of plant and materials which will be incorporated into the Works. The items shall be segregated by type as listed in the Specifications and the report should show as a minimum the following activities:
  - (a) purchase Order Date - Scheduled/Actual,
  - (b) manufacturer/Supplier and Origin,
  - (c) letter of Credit Issued date,
  - (d) manufacturer/Supplier Ship Date - Scheduled/Actual,
  - (e) method of Shipment,
  - (f) arrival Date in India- Scheduled/Actual.

**9. PRODUCTION AND TESTING**

Deleted

**10. SAFETY**

- (1) A review of all safety aspects during the month including reports on all accidents and actions proposed to prevent further occurrence.

**11. ENVIRONMENTAL**

- (1) A review of all the environmental issues during the past month to include all monitoring reports, mitigation measures undertaken, and activities to control environmental impacts.

**EMPLOYER'S REQUIREMENTS****APPENDIX 6****QUALITY ASSURANCE****1. General**

The Contractor shall implement a Project Quality Management Plan in accordance with ISO- 9001 "Quality System - Model for Quality Assurance in Design/Development, Production, Installation and Servicing" to ensure that all materials, workmanship, plant and equipment supplied, and work done under the contract meets the requirements of the contract. This plan shall apply to all activities related to the quality of items, including designing, purchasing, inspecting, handling, assembling, testing, storing, and shipping of materials and equipment and different elements of construction work and installations of system components.

The Quality Plan to be prepared by the Contractor and submitted to the Engineer shall follow the requirements of ISO 9000 and address each element therein.

Registration of the Contractor's organization, or subcontractors or sub-consultants is not required for this Project, but the Project Quality Management Plan as submitted shall meet the intent of the ISO 9000 requirement in that there is a comprehensive and documented approach to achieving the project quality requirements.

**2. Quality Assurance Management Plan**

The Project Quality Management Plan (PQMP) shall as a minimum address the quality system elements as required by ISO 9001, generally noting the applicability to the Contractor's Works Programme for the Project. Procedures or Quality Plans to be prepared by others (Suppliers, Subcontractors, and Sub-consultants) and their incorporation in the overall PQMP shall be identified.

The Contractor shall provide and maintain a Quality Assurance Plan (QA) to regulate methods, procedures, and processes to ensure compliance with the Contract requirements. The QA Plan, including QA written procedures, shall be submitted to the Engineer for his review.

Adequate records shall be maintained in a readily retrievable manner to provide documented evidence of quality monitoring and accountability. These records shall be available to Employer at all times during the term of the Contract and during the Defects Liability Period and for a five year period thereafter.

The Plan shall identify:

- Design Process: that control, check and verify the accuracy, completeness and integration of the design shall be performed by certified personnel and in accordance with documented procedure that have the written consent of the Engineer.
- Special Processes: that control or verify quality shall be performed by certified personnel and in accordance with documented procedures that have the written consent of the Engineer.
- Inspection and Test: Inspection and testing instructions shall provide for reporting non-conformances or questionable conditions to the Engineer; Inspection shall occur at appropriate points in the installation sequences to ensure compliance with drawings, test specifications, process specifications, and quality standards. The Engineer shall designate, if necessary, inspection hold points into installation or inspection planning procedures.
- Receiving Inspection: These procedures shall be used to preclude the use of nonconforming materials and to ensure that only correct and accepted items are used and installed.
- Identification and Inspection Status: a system for identifying the progressive inspection status equipment, materials, components, subassemblies, and assemblies as to their acceptance, rejection, non-inspection shall be maintained.
- Identification and Control of Items: an item identification and traceability control shall be provided.



- Handling, Storage, and Delivery: provide for adequate work, surveillance and inspection instructions.

The Plan shall ensure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, and defects in materials and equipment shall be promptly identified and corrected.

The Plan shall provide for establishing, and maintaining an effective and positive system for controlling non-conforming material including procedures for the identification, segregation, and disposal of all non-conforming material. Dispositions for the use or repair of non-conforming materials shall require the Engineer's consent.

### **3. Plan Implementation and Verification**

The Plan shall clearly define the QA Organization. Management responsibility for the QA shall be set forth on the Contractor's policy and organization chart. The Plan shall define the requirements for Q/C personnel, their skills and training. Records of personnel certifications shall be maintained and monitored by the QA personnel. These records shall be made available to the Engineer for review, upon request.

The QA operations shall be subject to the Engineers, Employer or Employer's authorized representative's verification at any time, including surveillance of the operations to determine that practices, methods and procedures of the plan are being properly applied; inspection to measure quality of items to be offered for acceptance; and audits to ensure compliance with the Contract documents.

The contractor's Quality Audit Schedule shall be submitted to the Engineer for consent every three months or more frequently as required. The results of Quality Audits shall be summarized in the Contractor's monthly reports.

The Contractor shall provide all necessary access, assistance, and facilities to enable the Engineer to carry out on-site and off-site surveillance of Quality Assurance Audits to verify that the quality system which has the consent of the Engineer is being implemented fully and properly.

**EMPLOYER'S REQUIREMENTS**  
**APPENDIX 7**  
**DRAUGHTING AND CAD STANDARDS**

**1. INTRODUCTION**

- (1) The purpose of this document is to define the minimum Draughting and CAD standard to be achieved by the Contractor for all drawings produced by the Contractor for the purpose of the Works.
- (2) By defining a common format for the presentations of drawings and CAD files, the exchange of drawn information is improved and will maximize the use of CAD in the co-ordination process.
- (3) All submissions shall be made to the Employer's Requirement in a format reviewed without objection by the Employer's Requirement and in accordance with the requirements in:
  - (a) the Contract.
  - (b) the Document Submittal Instructions to Consultants and Contractors.
- (4) Paper and drawing sizes shall be "A" series sheets as specified in BS 3429.
- (5) The following software latest and update version compatible for use with Intel-Windows based computers shall be used, unless otherwise stated, for the various electronic submissions required:

**Document Type Electronic Document Format**

Text Documents MS Word,

Spread Sheets MS Excel,

Data Base Files MS Access,

Presentation Files MS PowerPoint,

Programmes latest version Primavera for Windows, Sure track AutoCAD/Graphics Corel Draw/  
AutoCAD

Photographic Adobe Photoshop,

Desktop Publishing Page Maker

CAD Drawings AutoCAD

- (6) Media for Electronic File Submission: One copy shall be submitted unless otherwise stated in DVD/CD-ROM or Suitable electronic medium.
- (7) Internet File Formats/Standards
  - (a) The following guidelines shall be followed when the Contractor uses the Internet browser as the communication media to share information with the Employer.
  - (b) All the data formats or standards must be supported by Microsoft Internet Explorer latest version, or above running on Windows 10.
  - (c) The following lists the file types and the corresponding data formats to be used on Internet.

The Contractor shall comply with them unless prior consent is obtained from the Employer's Requirement for a different Data format:

File Type	Data Format
Photo Image	Joint Photographic Experts Group (JPEG)

Image other than Photo	GIF or JPEG
Computer Aid Design files (CAD)	Computer Graphics Metafile (CGM)
Video	Window video (.avi)
Sound	Wave file (.wav)

(8) The following states the standards to be used on Internet when connecting to database(s). The Contractor shall comply with them unless prior consent is obtained from the Employer's Requirement for a different standard:

Function to be Implemented	Standard to be Complied With
Database connectivity	Open Database Connectivity (ODBC)
Publishing hypertext language on the WorldWide Web	Hypertext Markup Language (HTML)

The hard copy of all documents shall be the contractual copy.

## 2. GENERAL REQUIREMENTS

### a. General

(1) The Contractor shall adopt a title block similar to that used in the Drawings for all drawings prepared under the Contract.

(2) Each drawing shall be uniquely referenced by a drawing number and shall define both the current status and revision of the drawing.

(3) The current status of each drawing shall be clearly defined by the use of a single letter code as follows:

P - Preliminary Design Drawing D - Definitive Design Drawing

C - Construction Reference Drawing W - Working Drawing

B - As-Built Drawing

M - As Manufactured Drawing E - Employer's Drawing

### 2.2 Types of Drawing

- 1) 'Design drawings' mean all drawings except shop drawings and as-built drawings.
- 2) 'Working drawings' are design drawing of sufficient detail to fully describe the works and adequate to use for construction or installation.
- 3) Site drawings and sketches are drawings, often in sketch form, prepared on site to describe modifications of the Working drawings where site conditions warrant changes that do not invalidate the design.
- 4) 'Shop drawings' are special drawings prepared by the manufacturer or fabricator of various items within the Works to facilitate manufacture or fabrication.
- 5) 'As-built drawings' show the Works exactly as constructed or installed. They are usually prepared by amending the working drawings to take into account changes necessitated by site conditions and described in Site drawings. These drawings shall be completed on a regular basis as the works progress and shall not be left until completion of the entire works.

## 3 COMPUTER AIDED DESIGN & DRAUGHTING (CAD) STANDARDS

### 3.1 Introduction

#### Scope of Use

Data input procedures between the Engineer and contractors must be coordinated, and the key parameters used to form CAD data files must be standardized. The production of all CAD data files shall comply with the following requirements.

### 3.2 Objectives

The main objectives of the CAD standards are as follows:

- (a) To ensure that the CAD data files produced for Project are coordinated and referenced in a consistent manner.
- (b) To provide the information and procedures necessary for a CAD user from one discipline or external organization to access (and use as background reference), information from a CAD data file prepared by another discipline or external organization.
- (c) To standardize the information contained within CAD data files which may be common to more than one discipline such as drawing borders, title boxes, grid lines etc.
- (d) To establish procedures necessary for the management of CAD data files.
- (e) To ensure all contractors use 'Model space' and 'Paper space' in the production of their CAD files.

### **3.3 General**

- (1) To facilitate co-ordination between contractors, it is a requirement that all drawings issued by contractors for co-ordination or record purposes shall be produced using CAD methods. Drawings shall be issued in digital format in addition to the paper copies.
- (2) The intent of the issue of digital information is to aid the related design by others. The definitive version of all drawings shall always be the paper or polyester film copies which have been issued by the contractor or organization originating the drawing.
- (3) Drawings and drawing packages issued for co-ordination, record purposes or for acceptance shall be accompanied by a complete set of the corresponding CAD data files.
- (4) Any contractor or organization making use of the CAD data from others shall be responsible for satisfying him that such data is producing an accurate representation of the information on the corresponding paper drawing which is satisfactory for the purpose for which he is using it. Provided the general principles of this section have been achieved by the originator of the CAD data, contractors making use of the CAD data from others shall not be entitled to require alterations in the manner, in which such CAD data is presented to them.
- (5) In particular, automatic determination of physical dimensions from the data file shall always be verified against the figured dimensions on the paper or polyester drawings. Figured dimensions shall always be taken as correct where discrepancies occur.

### **3.4 Terminology & Associated Standards / Guidelines**

Any terminology used within this section that is ambiguous to the user shall be clarified with the Employer's Requirement. British Standard BS1192 is used in principle as a guide for drawing practice, convention, CAD data structure and translation.

### **3.5 Paper Drawings**

- (1) For the Project "Paper" drawings are considered to be the main vehicle for the receipt and transmittal of design and production information, typically plans, elevations and sections.
- (2) The Project wide accepted media for the receipt and transmittal of "Paper" drawings will be paper and polyester film of various standard ISO 'A' sizes. The composition of this information shall be derived from a CAD "Model".
- (3) The CAD derived "Paper" drawing composition will reflect a window of information contained within a CAD "Model Space" file together with a selection of information contained within the associated CAD "Paper Space" file.

### **3.6 CAD Data Creation, Content & Presentation**

A consistent method of CAD data creation, together with content and presentation is essential. The method of CAD "Model Space and Paper Space" creation is as follows:

- (1) Model Space Files

- (a) Typically, CAD "Model Space" files are required for general arrangement and location plans and will consist of a series of other "Model Space" referenced CAD files covering the total design extents at a defined building level (the number of referenced files should be kept to an absolute minimum). Data contained within a CAD "Model Space" files is drawn at full size (1:1) and located at the correct global position and orientation on the Project Grid / or defined reference points.
  - (b) Each CAD "Model Space" file will relate to an individual discipline. Drawing border / text, match / section lines or detailed notation shall NOT be included within a CAD "Model Space" file. Dimensions shall be included within a CAD "Model Space" but located on a dedicated layer. Elevations, Long Sections and Cross Sections shall also be presented in CAD "Model Space" as defined above, but do not need to be positioned and orientated on the Project Grid.
- (2) Paper Space CAD Files
- (a) Paper Space" CAD files are utilized to aid the process of plotting "Paper" drawings and are primarily a window of the CAD "Model Space" file. A "Paper Space" CAD file will typically contain drawing borders, text, match or section lines & detailed notation. Once these files are initially set up and positioned the majority of "Paper Drawing" plots at various approved scales re efficiently and consistently generated by displaying different combinations of element verse and symbology contained within the "Paper Space" file and the referenced "Model pace"files.
  - (b) The purpose is to ensure that total co-ordination is achieved between the CAD "Model Space" file and the "Paper Drawing" output during the revision cycle of the design and production process. Duplicated data in "Model and paper Space" files will not be acceptable unless an automatic update link exists between the two data sets. "Paper Space" files are not typically required as part of the CAD Media Receipt from contractors, unless specifically requested.

### **3.7 CAD Quality Control Checks**

- (1) Random CAD Quality Control Audits will be carried out by Engineer on all CAD media received and transmitted.
- (2) These checks DO NOT verify the technical content of the CAD data received or transmitted (as this is the responsibility of the originating organization), however compliance with Project CAD and Draughting Standards shall be checked.
- (3) In addition, all contractors who transmit and receive CAD data from the Project shall have CAD quality control procedures in place. A typical quality control procedure shall contain CAD data quality checking routines coupled with standards for CAD data transmittal and archiving.

### **3.8 CAD Data Transfer Media and Format**

When CAD data is received & transmittal between Engineer and the Contractor, the media shall be as follows:

- (a) Data Exchange Format - AutoCAD 2019 (.DWG) or latest version
- (b) Operating System -/ Window 10 /windows Latest version
- (c) Data Transfer Media: CD ROM/ RW /pen drive plus E-mail

All Data Transfer Media must be labeled on the data shield with:

- (i) Name of Company
- (ii) Project Title
- (iii) Drawing Filenames (for diskettes only)
- (iv) CD/pen drive no.
- (d) All data Transfer Media shall be submitted with a completed Form
- (e) The Contractor must ensure the supplied Data Transfer media is free from virus. SUB-directories on tapes or disks are not permitted. If CAD Data is created using UNIX, archive commands must be unrooted.

### **3.9 CAD Media Receipt & Transmittal**

- (1) CAD Media Transmittal (from the Contractor to Engineer) - this will consist of the following:
  - (a) CAD Digital Media
  - (b) CAD data sheet
  - (c) CAD issue / revision sheet
  - (d) CAD Quality Checklist confirming compliance.
  - (e) Plot of each "Model Space" file issued on an A1 drawing sheet (to best fit).
- (2) The above CAD media will be collectively known as "CAD Media Transmittal Set". The CAD data file transmittal format required by Employer 's Representative from all contractors shall be in AutoCAD (Latest version)
- (3) All CAD media received from contractors will be retained by Engineer except for SCSI disk (if used) as an audit trail / archive of a specific contractor's design evolution.
- (4) CAD Media Receipt (from Engineer to the Contractor)
  - (a) CAD media should normally be obtained from the respective interfacing contractor(s), but should Engineer issue CAD media it will consist of the following:
    - (i) CAD Digital Media typically contain only CAD "Model Space" files.
    - (ii) CAD data sheet.
    - (iii) CAD issue / revision sheet
  - (b) The above CAD media will be collectively known as the "CAD Media Receipt Set". The CAD data file transmittal format used by Engineer to all contractors will be in AutoCAD (latest version)
- (c) Each CAD transmittal digital medium will be labeled with proper label as approved by the Engineer/ Any CAD data transmitted without this label is assumed to be provisional information not to have been quality checked and therefore not formally issued.

### 3.10 Revisions

- (1) All 'Revisions', 'In Abeyance' and 'Deletions' shall be located on a common layer. This layer can be turned on or off for plotting purposes.
- (2) The following example text indicates the current CAD file revision, i.e. 'Revision [A]'. This shall be allocated to a defined layer on all CAD "Model Space" files, in text of a size that will be readable when the CAD "Model Space" file is fitted to the screen, with all levelson.

### 3.11 Block Libraries, Blocks, & Block Names

- (1) All Construction Industry symbols produced as CAD Cells shall typically conform to British Standard BS1192 - part 3.
- (2) All Blocks created shall be Primitive (i.e. NOT Complex) and shall be placed Absolute (i.e. NOT Relative).
- (3) The Contractor's specific block libraries shall be transmitted to Engineer together with an associated block library list containing the filename (max. 6 characters) and block description. The Contractor shall ensure that the library is regularly updated and circulated to all other users, together with the associated library listing.
- (4) All Blocks of a common type, symbols or details should initially be created within a CAD "Model Space File" specifically utilized for that purpose. These files will be made available on request by Employer's Representative.
- (5) Blocks created will typically be 2D unless 3D is specifically requested. In both instances they shall have an origin at a logical point located within the extents of each Block's masked area or volume.

### 3.12 CAD Dimensioning

Automatic CAD Dimensioning will be used at all times. Any dimensional change must involve the necessary revision to the model space file. If the CAD Quality Control Checks find that the revisions have not been correctly carried out, the rejection of the entire CAD submission will result.

### 3.13 CAD Layering

All CAD elements shall be placed on the layers allocated for each different discipline. The layer

naming convention to be adopted by the Contractor shall be submitted for acceptance and inclusion within these standards.

**3.14 Global origin, Location & Orientation on the Alignment Drawing.**

- (1) Location or Plan information in "Model Space" files shall coincide with the correct location and orientation on the Project grid for each specific contract.
- (2) Location plans shall have at least three setting out points shown on each CAD "Model Space" file. Each setting out point shall be indicated by a simple crosshair together with related Eastings and Northings co-ordinates. The Civil Contractor(s) will establish the three setting out co-ordinates for their respective works, which will then be used by all other contractors including the Contractor.

**3.15 Line Thickness and Colour**

To assist plotting by other users, the following colour codes will be assigned to the following line thickness / pen sizes.

Colour	Code No	Line Thickness
Red	10	0.18
White	7	0.25
Yellow	2	0.35
Brown	34	0.5
Blue	130	0.7
Orange	30	1.0
Green	3	1.4
Grey	253	2.0

**3.16 CAD Utilization of 2D & 3D Files**

Although the project standard is 2D CAD files, certain disciplines and contractors may use 3D CAD files for specific applications or where the isolated use of 3D aids the design and visualization process (i.e., Architecture, Survey and Utilities). In these specific instances 3D CAD data will only be transmitted if all other users can use this data. If this is not the case, 3D to 2D translation shall be processed by the creator prior to issue.

**3.17 CAD File Numbering**

- (1) Contractors CAD File Numbering shall be described in 2.2 above.
- (2) Employer CAD File numbering unlike most of the contractors, Employer will not be required to produce numerous CAD files. This will follow the numbering system Except that the status of the drawing in 2.1(3) shall be "E".

**3.18 CAD File Naming Convention - General**

CAD "Model Space" files shall be named in accordance with general drawing conventions. Note: The CAD standards shall be compatible with 5D BIM platform of MahaMetro

**3.19 ERP, OSO and 5D-BIM Platform**

Maha-Metro have created a Digital platform for Project Management comprising an ERP system and a 5D Building Information Modeling system along with other components. This will be the central repository of all information used by Maha-Metro. It will require information on project timelines, progress reports, estimates of material and costs, 2D and 3D drawings, to be submitted to the central system by contractors executing engineering, construction and other activities on site. The central system will also provide information to the contractors for execution.

All effort will be made to create interfacing mechanisms using standards-based approach such that it can take and provide inputs to all kinds of systems built using industry recognized standards. Some of the systems under consideration include SAP ERP, Primavera/Microsoft Project for project management and AutoCAD/Bentley/RIB for 5D BIM.



The ERP will have published standard APIs for integration and similarly the project management solutions can interchangeably read formats from the abovementioned popular tools. The standards used for drawing interchange include the popular DXF (Drawing Exchange Format) and ANSI standard IGES (Initial Graphics Exchange Specification).

The bidder should have such experts conversant with the above proposed digital platform for the entire duration of the work.

**EMPLOYER'S REQUIREMENTS****APPENDIX 8****WORKS AREAS & TEMPORARY POWER SUPPLY****1. INTRODUCTION**

- (1) The Contractor shall provide within the designated principal Works Areas, at locations agreed with the Engineer, the compounds and facilities for the Engineer and other contractors of the Employer defined under Clause 2 of this Appendix.
- (2) The standard conditions applying to the use of any Works Area by the Contractor for its site facilities are given under Clause 2 of this Appendix.
- (3) The Conditions for supply of electricity by the Contractor to Designated Contractors are given under Clause 3 of this Appendix.

**2. STANDARD ENGINEERING CONDITIONS**

The following standard engineering conditions apply to all Works Areas:

- (1) Formation
  - a. The Works Areas shall be formed to the levels that the Engineer has given his consent. No such levels shall be amended without prior consent of the Engineer.
  - b. The Works Areas shall be surfaced in a manner agreed with the Engineer, compatible with their intended use, and, in particular, footpaths and roadways connecting facilities shall be clearly defined. Measures shall be taken to the satisfaction of the Engineer to ensure all areas are properly drained and kept free of static water.
  - c. The removal, diversion or reinstatement elsewhere as may be required of any existing works or installation whatsoever within the Works Areas shall be carried out to the satisfaction of the Engineer.
- (2) Roads & Parking
  - (a) Space shall be provided within the Works Areas for parking, loading/unloading and maneuvering of motor vehicles.
  - (b) Any damage done to the adjoining public roads and fixtures and properties (public or private) shall be made good to the satisfaction of the Engineer.
- (3) Drainage & Sewerage
  - (a) All storm or rainwater from the Work Areas including any access roads thereto shall be conveyed to the nearest stream course, catch-pit, channel or storm water drain as required by the Engineer. All temporary and permanent works shall be carried out in such a manner that no damage or nuisance are caused by storm water or rain water to the adjacent property.
  - (b) No drain or watercourse shall be used without consent of the Engineer.
  - (c) Damages or obstructions caused to any watercourse, drain, water-main or other installation within or adjoining the Works areas shall be made good to the satisfaction of the engineer.
  - (d) Treatment and disposal of sewage and wastewater from the works areas shall be provided to the satisfaction of the engineer.
- (4) Buildings
  - (a) No permanent structures other than those required for the Permanent Works shall be permitted on the Works Areas.
  - (b) Electricity, water, telephone and sewerage shall be provided by the Contractor, as required, for all temporary buildings.
  - (c) No potable water obtained from the Govt. sources shall be used for heating, cooling and humidification purposes, or vehicle washing without the written consent of the Engineer.

(5) **Pedestrian Access**

Every existing pedestrian access throughout the Works Areas shall be maintained in a usable condition at all times to the satisfaction of the Engineer including lighting, signing and guarding.

(6) **Fencing**

The Works Areas shall be secured against unauthorised access at all times. In particular fencing or the like shall be maintained, removed and re-erected in the new location wherever and whenever a Works Area is relinquished in stages.

**3. Applicability**

(1) Where the Contractor is required to provide temporary electrical supplies, or to use, extend or expand on temporary supplies installed by others, all such activity shall be executed in accordance with Paragraphs of this Appendix.

(2) When the Contractor makes use of temporary electrical supplies provided by others he will observe and comply with the requirements of this Appendix.

**4. Work on Site**

(1) The contractor shall nominate a representative whose name and qualifications shall be submitted in writing to the Engineer for review not later than 4 weeks before the appointment and who shall be solely responsible for ensuring all necessary electrical equipment on site. The contractor shall not install or operate any temporary site electrical systems until his representative is appointed and has commenced duties.

(2) The name and contact telephone number of the representative having been reviewed without objection by the Engineer shall be displayed at the main distribution board for the temporary electrical supply so that he can be contacted in case of an emergency.

(3) Schematic diagrams and the details of the equipment for all temporary electrical installations shall be submitted by the Contractor, and these diagrams together with the temporary electrical equipment shall be submitted to the Engineer for his consent.

(4) All electrical installation work on Site shall be carried out in accordance with the requirements laid down in BS 7375 and the Specification. All work shall be supervised or executed by qualified and suitably categorized electricians, who are registered as such under the Electricity Ordinance 1990/Electricity (Registration) Regulations 1990.

**5. Electrical General**

Temporary electrical Site installations and distribution systems shall be in accordance with:-

- (1) Indian Electricity Rules
- (2) The Power Companies' Supply Rules;
- (3) Electricity and its subsidiary Regulations;
- (4) IEE Wiring Regulations (16th Edition);
- (5) BS 7375 Distribution of Electricity on Construction and Building Sites;
- (6) BS 4363 Distribution Assemblies for Electricity Supplies for Construction and Building Sites;
- and
- (7) BS 6164 Safety in Tunneling in the Construction Industry.
- (8) Any other applicable national standards

**6. Materials, Appliances and Components**

All materials, appliances and components used within the distribution system shall comply with BS 4363 and BS 7375 Appendix A.

**7. Design Considerations**

(1) Distribution equipment utilized within the temporary electrical distribution system shall incorporate the following features:-

- (a) Flexibility in application for repeated use;
  - (b) Suitability for transport and storage;
  - (c) Robust construction to resist moisture and damage; and
  - (d) Safety in use.
- (2) All cabling shall be run at high level whenever possible and firmly secured to ensure they do not present a hazard or obstruction to people and equipment.
- (3) The installation on Site shall allow convenient access to authorized and competent operators to work on the apparatus contained within.

## **8. Mains Voltage**

- (1) The site mains voltage shall be as per the electricity authority, 415V/3 phase 4 wire system.
- (a) single phase voltage shall be as per the electricity authority, 230V supply.
  - (b) Reduced voltages shall conform to BS 7375.

## **(2) Types of Distribution Supply**

The following voltages shall be adhered to for typical applications throughout the distribution systems:

- (a) fixed plant - 415V/ 3 phase;
- (b) movable plant fed by trailing cable - 415V /3 phase;
- (c) installations in Site buildings - 230V /1 phase;
- (d) fixed flood lighting - 230V/1 phase;
- (e) portable and hand held tools -115V /1 phase;
- (f) Site lighting (other than flood lighting) -115V /1 phase; and
- (g) Portable hand-lamps (general use) -115V /1 phase.

(3) When the low voltage supply is energized via the Employer's transformer, any power utilized from that source shall be - either 415 V. 3 phase or 230 V. 1 phase as appropriate. The Contractor shall carry out any conversion that may be necessary to enable him to use power from that source.

## **(4) Protection of Circuits**

- (a) Protection shall be provided for all main and sub-circuits against excess current, under and over voltage, residual current and earth faults. The protective devices shall be capable of interrupting (without damage to any equipment or the mains or sub-circuits) any short circuit current that may occur.
- (b) Discrimination between circuit breakers, circuit breakers and fuses shall be in accordance with:-
- (i) BS 88;
  - (ii) BS EN 60898; and
  - (iii) BS 7375;
  - (iv) Any other appropriate Indian Standards.

## **9. Earthing**

- (1) Earthing and bonding shall be provided for all electrical installations and equipment to prevent the possibility of dangerous voltage rises and to ensure that faults are rapidly cleared by installed circuit protection.
- (2) Earthing systems shall conform to the following standards:-
- (a) IEE Wiring Regulations (16th Edition);
  - (b) BS 7430;
  - (c) BS 7375; and
  - (d) IEEE Standard 80 Guide for Safety in AC Substation Grounding.

## **10. Plugs, Socket Outlets and Couplers**

Low voltage plugs, sockets and couplers shall be color coded in accordance with BS 7375, and

constructed to confirm BS EN 63809 high voltage couplers and 'T' connections shall be in accordance with BS 3905.

#### **11. Cables**

- (1) Cables shall be selected after full consideration of the conditions to which they will be exposed and the duties for which they are required. Supply cables up to 3.3KV shall be in accordance with BS 6346.
- (2) For supplies to mobile or transportable equipment where operation of the equipment subjects the cable to flexing, the cable shall conform to one of the following specifications appropriate to the duties imposed on it:
  - (a) BS 6708 flexible cables for use at mines and quarries;
  - (b) BS 6007 rubber insulated cables for electric power and lighting; and
  - (c) BS 6500 insulated flexible cords and cables.
- (3) Where low voltage cables are to be used, reference shall be made to BS 7375. The following specifications shall also be referred to particularly for underground cables:-
  - (a) BS 6346 for armored PVC insulated cables; and
  - (b) BS 6708 Flexible cables for use at mines and quarries.
- (4) All cables which have a voltage to earth exceeding 65 V (except for supplies from welding transformers to welding electrodes shall be of a type having a metal sheath and/or armour which shall be continuous and effectively earthed. In the case of flexible or trailing cables, such earthed metal sheath and/or armour shall be in addition to the earth core in the cable and shall not be used as the sole earth conductor.
- (5) Armoured cables having an over sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring.
- (6) For resistance to the effects of sunlight, overall non-metallic covering of cables shall be black in colour.
- (7) Cables which have applied to them a voltage to earth exceeding 12 V but not normally exceeding 65 V shall be of a type insulated and sheathed with a general purpose or heat resisting elastomer.
- (8) All cables which are likely to be frequently moved in normal use shall be flexible cables. Flexible cables shall be in accordance with BS 6500 and BS 7375.

#### **12. Lighting Installation**

- (1) Where Site inspection of the Works is required during the nights, the Lighting circuits shall be run separate from other sub-circuits and shall be in accordance with BS 7375 and BS 4363.
- (2) Voltage shall not exceed 55 V to earth except when the supply is to a fixed point and where the lighting fixture is fixed in position.
- (3) Luminaries shall have a degree of protection not less than IP 54. In particularly bad environments where the luminaries are exposed to excesses of dust and water, a degree of protection to IP 65 shall be employed.
- (4) The Contractor shall upgrade the lighting level to a minimum of 200 lux by localized lighting in all areas where required by the Engineer.
- (5) Mechanical protection of luminaries against damage by impact shall be provided by use of wire guards or other such devices whenever risk of damage occurs.

#### **13. Electrical Motors**

- (1) Totally enclosed fan cooled motors to BS 4999: Part 105 shall be used.
- (2) Motor control and protection circuits shall be as stipulated in BS 6164. The emergency stops for machinery shall be provided

#### **14. Inspection and Testing.**

Electrical installations on Site shall be inspected and tested in accordance with the requirements of the IEE Wiring Regulations (16th Edition).

#### **15. Identification**

Identification labels of a type reviewed without objection by the Engineer shall be affixed to all

electrical switches, circuit breakers and motors to specify their purpose.

**16. Maintenance:**

(1) Strict maintenance and regular checks of control apparatus and wiring distribution systems shall be carried out by an electrician (duly qualified to carry out the said checks) to ensure safe and efficient operation of the systems. The Contractor shall submit for review by the Engineer details of his maintenance schedule and maintenance works record.

(2) All portable electrical appliances shall be permanently numbered (scarf tag labels or similar) and a record kept of the date of issue, date of the last inspection carried out and the recommended inspection period.

**17. Metering**

The Contractor shall install a separately metered and invoiced supply or supplies of electricity for:-

- (a) Site fabrication facilities;
- (b) Site workshops and work yards; and
- (c) Site offices and stores.

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 9**

**RAILWAY ENVELOPE**

**DELETED**

**EMPLOYER'S REQUIREMENTS****APPENDIX 10 A****APPROVED MANUFACTURERS /SUPPLIERS FOR CIVIL WORKS**

All materials and products shall conform to the relevant standards/specifications of IS code, BS Code etc. and shall be of approved make and design. A list of manufacturers / vendors is given herein below for guidance. The approval of a manufacturer/vendor shall be given only after review of the sample / specimen by the Client. The complete system and installation shall also be in conformity with the – **“Applicable Codes, Standards and Publications”**.

List of approved makes for products and materials is given below. Maha-Metro reserves the right to adhere any of the vendor against each of the item. Other equivalent manufacturers may be considered with prior approval.

<b>.No.</b>	<b>Details of Materials/Products</b>	<b>Manufacturer's Name</b>
1.	Epoxy / Polyester resin For fixing anchor fasteners in soffits	<ul style="list-style-type: none"> <li>• “Lokset” of Forsoc Chemicals (India) Limited</li> <li>• STP MBT</li> <li>• Apple chemie</li> </ul>
2.	Fire stop Sealant	<ul style="list-style-type: none"> <li>• Dow Corning's “Firestop Sealant 700: by</li> <li>• Universal Silicones Lubricants Pvt Ltd.</li> <li>• GE Silicone's Pensil 300 Fire stop Sealant”</li> </ul>
3.	Ply wood	<ul style="list-style-type: none"> <li>• Uniply</li> <li>• Europly</li> <li>• Archidply</li> <li>• Century ply</li> <li>• Hunsurply</li> <li>• Corbett</li> <li>• Duroply (Green marked, BWR Grade) of Sarda Plywood Industries Ltd.,</li> <li>• Green Plywood Kitply</li> </ul>
4.	Block board	<ul style="list-style-type: none"> <li>• Uniply</li> <li>• Euro Board</li> <li>• Green blockboard</li> <li>• Century board</li> <li>• Archid blockboard</li> <li>• Duroboard of Sarada Plywood</li> <li>• Bhutan Board</li> </ul>



5.	Veneers	<ul style="list-style-type: none"> <li>• Greenply</li> <li>• Euro make</li> <li>• Jackson</li> <li>• Timex</li> <li>• Legend</li> <li>• Sarda Plywood Industries Ltd.</li> </ul>
6.	Burl Veneer	<ul style="list-style-type: none"> <li>• Green</li> <li>• Euro make</li> <li>• Jackson</li> <li>• Venture Enterprise</li> <li>• Kitply Industries Ltd.</li> </ul>
7.	Adhesive	<ul style="list-style-type: none"> <li>• “Pidilite</li> <li>• Araldite</li> <li>• Jivanjor</li> <li>• Apple chemie</li> <li>• Don Construction Chemical Pvt Ltd</li> </ul>
	Cement based Adhesive	<ul style="list-style-type: none"> <li>• Ultratech</li> </ul>
	Tiles adhesives	<ul style="list-style-type: none"> <li>• Don Construction Chemical Pvt Ltd</li> </ul>
8.	Flush Doors	<ul style="list-style-type: none"> <li>• Kutty,</li> <li>• Karnataka State forest department,</li> <li>• Green, Decorative Duroply (Green marked),</li> <li>• Kitply</li> </ul>
9.	Plastic Laminates	<ul style="list-style-type: none"> <li>• Formica</li> <li>• Greenlam</li> <li>• Vir</li> <li>• Sundeck</li> <li>• Neoluxe</li> <li>• Bakelite Hylam</li> </ul>
10.	Aluminium Sections	<ul style="list-style-type: none"> <li>• Indian Aluminium Co.</li> <li>• Hindustan Aluminium /</li> <li>• Jindal,</li> <li>• Boruka</li> </ul>
11.	Aluminium Composite Panel	<ul style="list-style-type: none"> <li>• Flexibond</li> <li>• Alucobond</li> <li>• AluKbond</li> <li>• Eurobond</li> <li>• AlucoPanel</li> <li>• Viva</li> </ul>
12.	Float Glass/Toughened Glass Insulating Glass	<ul style="list-style-type: none"> <li>• Float Glass India Ltd</li> <li>• Modiguard</li> <li>• Saint Gobain</li> </ul>
13.	Bevelled and Embossed Glass/Mirrors	<ul style="list-style-type: none"> <li>• Gujarat Guardian Ltd.</li> <li>• Modi</li> <li>• Saint Gobain</li> </ul>

14.	Powder Coatings	<ul style="list-style-type: none"> <li>• Berger</li> <li>• Nerocoat</li> <li>• Jenson &amp; Nicholson</li> </ul>
15.	Asphalt Emulsion	<ul style="list-style-type: none"> <li>• Karnak Chemical Corporation</li> <li>• STP</li> </ul>
16.	Tile Joint Filler	<ul style="list-style-type: none"> <li>• Bal Adhesives &amp; Grouts</li> <li>• “Roff Rainbow Tile mate” of Roff construction Chemicals Pvt Ltd.</li> <li>• Winsil 20/Silicon Sealant of GE Bayer Silicon</li> <li>• “Zentrival FM” of MC-Bauchemie (IndiaPvt Ltd)</li> <li>• Apple Chemie</li> <li>• BASF</li> </ul>
17.		<ul style="list-style-type: none"> <li>• Kajaria Ceramics Limited</li> <li>• Arpitha Exports</li> </ul>
18.	Heavy Duty Chequered Tiles	<ul style="list-style-type: none"> <li>• NITCO</li> <li>• Modern Tiles</li> </ul>
19.	Ceramic Tiles	<ul style="list-style-type: none"> <li>• Kajaria</li> <li>• Bell</li> <li>• Spartek</li> <li>• Goldcoin</li> <li>• Johnson</li> <li>• Somany</li> <li>• RAK Ceramics</li> <li>• Murudeshwar Ceramics</li> </ul>
20.	Vitrified Tiles	<ul style="list-style-type: none"> <li>• “Naveen Diamontile” of Murudeshwar Ceramics Ltd.</li> <li>• “Granamite” of Restile Ceramics Limited</li> <li>• “Marbo Granit” of Bell Granito Ceramica Ltd</li> <li>• Johnson Tiles</li> <li>• Somany Tiles</li> </ul>
21.	Marble blended Vinyl Tiles/Sheet	<ul style="list-style-type: none"> <li>• Armstrong of Inarco Ltd</li> <li>• Terkett Floorings</li> <li>• Krishna Vinyl</li> </ul>

22.	Glass Mosaic Tiles	<ul style="list-style-type: none"> <li>• Mridul Enterprises</li> <li>• Italia</li> </ul>
PMRP Phase-1 Extension Tender No. P1Msc-32/2014		Part II- Work Requirement Section-VII Annexure-VII-3
23.	Marble Mosaic Tiles	<ul style="list-style-type: none"> <li>• Nitco</li> <li>• Basant Tiles</li> </ul>
24.	Aluminum Linear Ceiling	<ul style="list-style-type: none"> <li>• Luxalan</li> <li>• Interarch</li> <li>• J C Industries</li> <li>• Hunter Douglas</li> <li>• Fundermax</li> <li>• Armstrong</li> </ul>
25.	Steel Panel Ceilings	<ul style="list-style-type: none"> <li>• Interarch</li> <li>• Armstrong</li> <li>• Metckaft</li> </ul>
26.	Resin Bonded Glass Wool	<ul style="list-style-type: none"> <li>• Rockloyd</li> <li>• Kingsway</li> <li>• LLYOD Insulations (INDIA) Ltd.</li> </ul>
27.	MS Tubes	<ul style="list-style-type: none"> <li>• Tata</li> <li>• Lloyd Metal &amp; Engineering Co.</li> <li>• NSL Limited</li> </ul>
28.	Modified Bituminous	<ul style="list-style-type: none"> <li>• “Multiplas Standard” of Integrated Waterproofing Membrane Limited</li> <li>• “SUPER THERMOLAY”/”POLYFLEX” of STP Limited .</li> <li>• “LOTUS-3” of the Structural Waterproofing Co. Limited</li> <li>• “HEAVY DUTY POLYPLY” of Ana Roofings Private Ltd</li> <li>• Apple chemie</li> <li>• Shell</li> <li>• Hincola</li> </ul>
29.	Epoxy Putty	<ul style="list-style-type: none"> <li>• “Techoxy” by Choksey Chemicals Pvt Ltd.</li> <li>• Apple chemie</li> </ul>
30.	Polysulphide Sealants	<ul style="list-style-type: none"> <li>• Pidilite Industries Ltd .</li> <li>• STP</li> <li>• Fosroc</li> <li>• Choksey</li> <li>• Apple chemie</li> </ul>

		<ul style="list-style-type: none"> <li>Supreme Bituchem India Pvt. Ltd.</li> </ul>
	Polyurethane sealant	<ul style="list-style-type: none"> <li>Supreme Bituchem India Pvt. Ltd</li> </ul>
31.	Silicone Sealants	<ul style="list-style-type: none"> <li>G.E. Bayer Silicone</li> <li>Dow Corning</li> <li>Waclear</li> </ul>
32.	Sealant Joints	<ul style="list-style-type: none"> <li>Watson Bowman Acme Corporation</li> <li>“Silpray” of G.E. Bayer Silicare</li> <li>Don Construction Chemicals pvt ltd</li> </ul>
33.	Paints	<ul style="list-style-type: none"> <li>I.C.I.</li> <li>Berger</li> <li>Jonson &amp; Nicholson</li> <li>Asian Paints</li> <li>Dulux</li> <li>Nerolac</li> <li>Surfa</li> <li>Advance Paints</li> </ul>
34.	Emulsion Paint	<ul style="list-style-type: none"> <li>ICI</li> <li>Dulux Velvet</li> <li>Luxol Silk</li> <li>Jonson &amp; Nicholson</li> <li>Asian Paints</li> <li>Dulux</li> <li>Nerolac</li> <li>Surfa</li> <li>M/s Godavari Paints Pvt Ltd</li> </ul>
35.	Synthetic Enamel	<ul style="list-style-type: none"> <li>I.C.I.</li> <li>Berger</li> <li>Jonson &amp; Nicholson</li> <li>Asian Paints</li> <li>Dulux</li> <li>Nerolac</li> <li>Surfa</li> <li>Advance Paints</li> </ul>
36.	Texture Paints	<ul style="list-style-type: none"> <li>Spectrum</li> <li>Unitile</li> <li>Surfa</li> <li>Birla</li> <li>M/s Godavari Paints Pvt Ltd</li> </ul>
37.	Polyurethane Paint	<ul style="list-style-type: none"> <li>MRF</li> <li>Berger</li> </ul>

		<ul style="list-style-type: none"><li>• Advance Paints</li><li>• Doall Paints</li></ul>
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38.	Wax Polish	<ul style="list-style-type: none"> <li>• Reckitt &amp; Colman</li> <li>• Asian</li> <li>• Berger</li> </ul>
39.	Melamine	<ul style="list-style-type: none"> <li>• ICI Delux Timberstone Melamine Coating</li> <li>• Asian /</li> <li>• Berger</li> </ul>
40.	Membrane Water Proofing	<ul style="list-style-type: none"> <li>• Padmaja Engineering Services, INC</li> <li>• Bitumat</li> <li>• Apple Chemie</li> <li>• Supreme Bituchem India Pvt. Ltd</li> <li>• Don Construction Chemicals pvt ltd</li> </ul>
		<ul style="list-style-type: none"> <li>• BASF</li> <li>• Pidilite</li> <li>• Hindcom Chemicals Limited</li> </ul>
	Cement based water proofing	<ul style="list-style-type: none"> <li>• Ultratech</li> </ul>
41.	Cement Bonded Particle Board	<ul style="list-style-type: none"> <li>• Bison Panel Board</li> <li>• Everest Industries</li> </ul>
42.	Stainless Steel Railings	<ul style="list-style-type: none"> <li>• Salem Steel</li> <li>• Jindal Stainless steel</li> <li>• GM 2 metal works</li> <li>• Entarchcon Infratech Pvt. Ltd.</li> </ul>
43.	Raised (Access) Floor / Cavity floor	<ul style="list-style-type: none"> <li>• Hewetson</li> <li>• United Insulation</li> <li>• Proactive Systems</li> <li>• Universal Infrastructure Systems</li> </ul>
44.	Fire Check Doors	<ul style="list-style-type: none"> <li>• Godrej</li> <li>• Shakthi Hormann Pvt.Ltd.</li> </ul>
45.	Pressed Steel Door Frames	<ul style="list-style-type: none"> <li>• Deccan Structural Systems Pvt. Ltd,</li> <li>• Agew</li> <li>• San-Harvic</li> </ul>
46.	Ceramic Claustra	<ul style="list-style-type: none"> <li>• Scindia Potteris</li> </ul>
47.	Interlocking Paving Tiles	<ul style="list-style-type: none"> <li>• Pavestone Marketing Pvt Ltd</li> <li>• Nitco Marble &amp; Granite Pvt. Ltd</li> </ul>
48.	Ashford Formula	<ul style="list-style-type: none"> <li>• JB Associates</li> </ul>
49.	Eleganstone	<ul style="list-style-type: none"> <li>• Bubna Commodities (P) Ltd</li> </ul>
50.	Roc Wool	<ul style="list-style-type: none"> <li>• Lloyd Insulation (India) Ltd</li> <li>• ROCKWOOL</li> </ul>

51.	Cavity Block	<ul style="list-style-type: none"> <li>• Apco Concrete Block</li> <li>• Besser Concrete Systems Ltd</li> <li>• Sobha Concrete Products</li> </ul>
52.	AAC Blocks	<ul style="list-style-type: none"> <li>• Hyderabad Industries Ltd</li> <li>• Ballarpur Industries Ltd</li> <li>• Ultratech</li> <li>• Ecolite AAC Blocks (JVS Comastsco Pvt Ltd)</li> </ul>
53.	Cement concrete designer tile	<ul style="list-style-type: none"> <li>• Eurocon tiles,</li> <li>• Duracrete</li> <li>• Ultra tiles.</li> </ul>
54.	Polycarbonate sheets	<ul style="list-style-type: none"> <li>• GE Plastics (Lexan)</li> <li>• Tuflite</li> </ul>
55.	Iron Mongery	<ul style="list-style-type: none"> <li>• Dorma</li> <li>• Ozone</li> </ul>
		<ul style="list-style-type: none"> <li>• Kich</li> <li>• Yale</li> <li>• Dorset</li> <li>• Henderson</li> <li>• Ebco</li> </ul>
56.	AAC Block joint adhesive	<ul style="list-style-type: none"> <li>• Ultratech</li> <li>• Apple Chemie</li> <li>• E-Mix Mortar (JVS Comastsco Pvt Ltd)</li> </ul>
57.	Readymade Plastering	<ul style="list-style-type: none"> <li>• Ultratech</li> <li>• Apple Chemie</li> </ul>
58.	Cement base grouting	<ul style="list-style-type: none"> <li>• Ultratech</li> <li>• Apple Chemie</li> <li>• BASF</li> <li>• Supreme Bituchem India Pvt. Ltd</li> <li>• Don Construction Chemicals pvt ltd</li> </ul>
59.	Baffel Celing	<ul style="list-style-type: none"> <li>• Armstrong</li> <li>• Hunter Douglas</li> </ul>
60.	Exterior cladding	<ul style="list-style-type: none"> <li>• Hunter Douglas</li> <li>• Fundermax</li> </ul>
61.	Perforated metal ceiling	<ul style="list-style-type: none"> <li>• Hunter Douglas</li> <li>• Fundermax</li> <li>• Armstrong</li> </ul>
62.	Glass Dome	<ul style="list-style-type: none"> <li>• Entrachcon Infratech Pvt. Ltd.</li> </ul>
63.	Tensile Roofing	<ul style="list-style-type: none"> <li>• Saint Gobain</li> </ul>
64.	Roof Latches	<ul style="list-style-type: none"> <li>• LATCHWAYS</li> </ul>
65.	AL Roof Vents	<ul style="list-style-type: none"> <li>• Agaris Airvent Systems</li> </ul>

66.	Roofing 1. Galvalume  2. Zincolume	<ul style="list-style-type: none"> <li>• Tata Blue Scope</li> <li>• JSW Steel</li> <li>• LLYOD Insulations (INDIA) Ltd.</li> <li>• VM Zinc</li> <li>• VIJAYANATH</li> <li>• LLYOD Insulations (INDIA) Ltd.</li> <li>• Tata Blue Scope</li> </ul>
67.	Toilet Cubicles	<ul style="list-style-type: none"> <li>• Macro Enterprises</li> <li>• M/s Inner space</li> </ul>
68.	Tactile Flooring	<ul style="list-style-type: none"> <li>• Johnson Tiles</li> </ul>
69.	CEM Board	<ul style="list-style-type: none"> <li>• USG Boral</li> <li>• NCL</li> </ul>
70.	Calcium Silicate Board	<ul style="list-style-type: none"> <li>• Promat</li> </ul>
71.	AL windows & Glazing	AJIT INDIA (Madras) Pvt. Ltd.
72.	Cement	ACC, Ultratech, Gujarat, Ambuja, Grasim, JK Lakshmi
73.	Reinforcement Bars	SAIL Plants, Rashtriya Ispat Nigam Ltd. Vizag Steel Plant, , Tata Steel , Ispat Industries , JSW Steel , JSPL, Essar TMT Steel , Electrosteel steels limited (foruse in non-dynamic structure), Ms Bhuleshwar Steels & Alloys Pvt Ltd (foruse in non-dynamic structure)
74.	Epoxy	FOSROC, SIKA QUALCRETE, Araldite, BASF
75.	Expansion Joints	Prequalified Manufacturers as per RDSO's latest approved list or as approved by NMRC.
76.	Admixtures	FOSROC, MBT. MC Baucheme, Sika, APEX, Pidilite, BASF, M/s Ultracon Infrachem(P) Ltd
77.	Pile Integrity Testing Agency	CBRI. Pile Dynamic. AIMIL, Geo dynamic.
78.	Anchor Fastener	HILTi. FISHER, BAUCH M/s Indo Spark Construction Services
79.	Structural Steel	TATA, SAIL, ESSAR, Jindal Steel & Power Ltd, JSW
80.	Stainless Steel	Jindal. SAIL
81.	Pre-stressing Strand (LRPC)	TATA SSL Ltd, USHA Martin, M/s Katarai Industries Pvt Ltd
82.	Welding Electrodes	ESAB. Advani - Orlikon Weld Alloy. Modi L&T Eutectic, Raajaratna electordes Pvt Ltd
83.	Pot/Elastomeric Bearings	Prequalified Manufacturers as per RDSO's latest approved list, DECG International



84.	Horizontal Tie Bars/Shear Bars	BB Bars System, BBV Systems ,Dextra
85.	HDPE Sheathing	Rex Polyextrusion, Gwalior Polypipes Ltd, M/s Dynamic Prestress, M.s Tirupati Plastomatics Pvt. Ltd
86.	Formwork Release Agent	FOSROC, MBT, MC Baucheme, Ado Conmat, CICO, SWC, Choksey, BASF, Adoadditives, STP
87.	Prestressing System	Freyssinet, BBR, VSL, Dynamic, Killick Nixon, Tensacciai (India Ltd.), Usha Martin, Posten, VSIL
88.	Reinforcement Couplers	Dextra, Moment. M/s Kridhan Infra
89.	Hollow Sections, Pipes	Surya Pipes, Hi-Tech Pipes, JSW, JSPL, Birla Aerocon Pipes and fittings
90.	Drainage Pipes	Tirupati Plastomatics, Duraline, REX, STIPL
91.	Acrylic Textured Coatings	Spectrum, Renova, Wallz, Surfa Nova, Jotun, Asian Paints
92.	Non shrink Grout	Fosroc Chemical (India). SIKA BASF, ELCHEM, MBT. Sika.
93.	Bonding Coat	CICO, FOSROC, Sunanda speciality coating Pvt. Ltd., BASF, SWC. TAM
94.	Polysuphide Sealant	CICO. Pidilite. BASF. FOSROC. SWC, STP, SIKA, Fairmate
95.	Steel Structural Fasteners	Pooja Forge, Sundram Fasteners, Unbrako, Nelson, Panchsheel
96.	Paints	Berger, Johnson Nicholson, Nerclac, Asian,
97.	Micro Silica	Sika, Elkem, FOSROC. MAPEI. Comiche, Star Silica, TAM, CALIPAR, CICO
98.	Fire Resistant Paints	Akzo Noble, PPG or equivalent, Jotun
99.	External Acrylic Emulsion	Berger, Apex, Asian, Nerolac, Jenson & Nicklson
100.	Integral Crystalline Waterproofing Method	Don Construction Chemicals pvt ltd
101.	Water stopper/Bar	Kanta Rubber. Greenstreak, Maruti, Duron
102.	Liquid polymer membrane waterproofing	INTEGRITANK, BASF. MAPEI, PIDILITE. DAVCO, CICO, Supreme Bituchem India Pvt. Ltd
103.	Curing Compound	Clean tech concure, SINAK, FOSROC, Ado additives, TAM, STP SWC. CICO, Rheoplast Technologies pvt. Ltd. M/s Magnum Pigments and Polymers (P) Ltd
104.	Polycarbonate Sheets	M/s Gallina Acroplus. Coxwell, Poly U, Fabric, SABIC I.DANPALON,
105.	Fly ash	Thermal plant. Ashcrete, Ultra pozz, star pozz, (the fly ash shall be as per our specifications)
106.	False Ceiling	Hunter Douglas

107.	ACP	Hunter Douglas, Durobuild
108.	Aluminum Louvers	Hunter Douglas-LUXALON H-3 , CS-RS-1605
109.	SS Railing	Sanvijay
110.	Barbed Wire / Chain-link fencing	Krishna Industries Bhilwara, / Concertina Coils New Delhi,
111.	PEB/Steel Structures/Pipe Structure	TT, Framecad, Voltagreen, Everest, ZAMIL
112.	Cement (For Brick Works, & General Work, Wall/Boundary Wall only)	Birla Gold (Manikgarh Cements), Dalmia Cement – op-53
113.	MS Angles & Flats	Ramson Steel (For general purpose only, not for dynamic & heavy loading structures)
114.	Corrosion Inhibitors -	Krishna Conchem Product Pvt. Ltd. Conchem Labs LLP
115.	Coal tar epoxy for sub-structure protection.	Krishna Conchem Product Pvt. Ltd.
116.	Porotherm lightweight clay hollow block/bricks	Wienrberger Bangalore
117.	Fibrillated polypropylene fibers	Bajaj Steel Industries Limited (for non-dynamic structure), Dolphin Floats Pvt Ltd
118.	Pre Engineering Building Pre fabricated Structural steel	M/S Kirby Building India Ltd
119.	Cold Rolled, Galvanized, Galvalume, Color Coated, HRPO, HRSP, Plain, Corrugated, Profiled, Sheets and Coils	M/s JSW Steel Coated Product Ltd
120.	Centrifugally Cast (Spun) iron pipes and fittings as per IS 15905 & ISO 6595 standards.  Centrifugally cast iron pipes and fittings as per IS 3989 specifications.  Ductile iron manhole covers, frames & gratings as per EN-124 standards.  Cast iron manhole covers, frames & gratings (ISI Marked) as per IS: 1726.	M/S Jayaswal Neco Industries Ltd
121.	Aluminium Composite.  Aluminium Colour Coated Coils.	M/S Alstrong Enterprises Pvt. Ltd, M/s Alstone International

122.	Pre Engineering Building, Pre Fabricated Structural Steel Grade	M/S PHENIX Construction Technologies(A Division Of M&B Engineering Limited)
123.	Waterproofing Membranes	M/S Tiki Tar Danosa (India) Private Limited
124.	Fire rated Steel Doors, Fire rated timbers Doors ,Fire Barriers, Fire rated Sliding Doors and Fire rated Rolling Shutters	M/S Signum Fire Protection India PVT Ltd M/s Basic doors
125.	ALCCOFINE 1203 Micro fine additive for concrete and mortars	M/S Counto Microfine Products Pvt Ltd
126.	Profiling of Galvanized and Colour Coated Roofing and Decking Sheet from approved Manufactures of sheets	M/S Aditya Profiles Pvt Ltd
127.	Manual Metal Arc Welding (MMAW) Electrodes	M/S Weldfast Electrodes Pvt Ltd
128.	MS ERW Black, Galvanized Round Pipes Hollow Sections	M/S APL Apollo Tubes Limited
129.	Manhole Covers, Gully Covers, Overhead water tank covers, Underground water tank covers & Gratings	M/S HP International
130.	Chemical Anchoring FriuIsider Mechanical Anchoring System	M/s Magnum Pigments and Polymers (P) Ltd M/S Ripple Construction Products Pvt Ltd M/s Indospark Construction Services
131.	Bronze and Brass gate Globe check strainers and ball valves and ductile iron and Aluminium Butterfly valves	M/S Kitz Corporation
132.	Steel Wire Ropes	M/S ORION ROPES Pvt Ltd
133.	Pre Engineered Structures and Structural Steel	M/S Apex Buildsys Turnkey Solution
134.	Industrial and decorative Paints, Powder Coating, Emulsion Paint, Synthetic Enamel and Polyurethane Paint	M/S Kansai Nerolac Paints Limited

135.	SHELLOXY-Crack bridging, decorative, flexible, anti-carbonation and waterproofing coating for concrete  SUPER SHIELD SELFPROTEK – Heavy Duty ,Cold applied, self adhesive water proofing membrane with HMHDPE laminated for electric insulation	M/S Supreme Bituchem India Pvt Ltd M/s Godavari Paints Pvt Ltd
136.	Rerolling of steel section, column section , Wide flange beam, channel section ,angle section for Non Dynamic Structures	M/s Shri Bajrang Alloys Ltd.
137.	Hot Rolled Structural Steel , Beam - 200mm to 600mm, Channel- 200mm to 600 mm ,Angle -130 mm to 200 mm and H-Beam -150 mm to 200 mm for Non Dynamic Structures	M/s Topworth steel &power Pvt Ltd.
138.	Pre Engineered Building (Steel Column & steel Roof)	M/s Richa Industries Ltd.
139.	Integral waterproofing compound, Wall putty, Floor hardeners, Grouts for machine foundation, Epoxy bonding agent and structural repair product	M/s Perma Construction Aids Pvt Ltd.

140.	Expansion joints, Epoxy Formwork Release Agent , Segment Bonding Agent , Acrylic Textured Coating, Bonding Coat or Bonding Agent, Polysulphide Sealant, Water Stopper /Bar, Liquid Polymer membrane Waterproofing, Curing Compound, Waterproofing Systems, Polymer	M/s Fair Mate Chemicals Pvt Ltd.M/s Inprocorp India Pvt Ltdlow
141	Bolts ,Nuts, Rivets,Studs,Screws Washers all types(HSG)	M/s BRK Industries

The above list is not exhaustive. Contractor may propose similar product of equal or superior quality or performance of other reputed vendor too for the works. However the approval /acceptance / rejection of proposed vendor rest with MAHA Metro.

**EMPLOYER'S REQUIREMENTS****APPENDIX 10 B****APPROVED MANUFACTURERS / SUPPLIERS FOR PLUMBING WORKS**

Sl. No.	Item	Vendor List for Plumbing work
1	Sanitary Fittings	<ul style="list-style-type: none"> <li>• Parryware</li> <li>• Jaquar</li> <li>• Hindware</li> </ul>
2	Water Cooler	<ul style="list-style-type: none"> <li>• Blue star Daikin Voltas</li> <li>• Oasis</li> </ul>
3	Water heater	<ul style="list-style-type: none"> <li>• Bajaj</li> <li>• AO Smith</li> </ul>
4	Pipes and related Fittings (GI,CI,DI,CPVC,UPVC)	<ul style="list-style-type: none"> <li>• TATA</li> <li>• Jindal</li> <li>• Apollo</li> <li>• Kapilansh Dhatu Udyog (P) Ltd.</li> <li>• Astral</li> <li>• Plasto</li> <li>• Supreme</li> <li>• HIL</li> <li>• Goodluck</li> </ul>
5	Horizontal centrifugal pumps	<ul style="list-style-type: none"> <li>• Kirlosker WILO KSB</li> <li>• Grundfos Becon CRI</li> <li>• SHAKTI PUMPS INDIA) PVT LTD.</li> </ul>
6	Valves	<ul style="list-style-type: none"> <li>• Inter Valves</li> <li>• Lehary</li> <li>• Kartar</li> <li>• Zotoisi</li> <li>• Sant</li> </ul>

The above list is not exhaustive. If contractor proposed to use another products of equal or superior quality or performance of similar specification & proven track record in place of product listed above, he may apply with Maha-Metro with sufficient proof of utilization by any other government agency in similar work along with test report of a renowned institutions/laboratory



**EMPLOYER'S REQUIREMENTS**

**APPENDIX 11**

**CURVE AND GRADIENT DETAILS**

**Deleted**



**EMPLOYER'S REQUIREMENTS**

**APPENDIX 12**

**UTILITIES**

**DELETED**

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 13**

**RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAM)**

**DELETED**

## **EMPLOYER'S REQUIREMENTS**

### **APPENDIX 14**

#### **CONTRACTOR'S SITE LABORATORY**

Contractor shall all the testing done as per approved ITP & QAP in approved NABL laboratories only or as directed by Maha Metro/Engineer at his own cost including transportation etc.

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 15**

**DELETED**

**EMPLOYER'S REQUIREMENTS**

**APPENDIX-16**

**EARTHING & GRID**

**DELETED**

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 17**

FOUNDATION DETAIL AND  
STATIC & DYNAMIC WEIGHT OF VARIOUS EQUIPMENTS

**DELETED**

**EMPLOYER'S REQUIREMENTS**

**APPENDIX 18**

**DELETED**

**APPENDIX 19**  
**List of approved Laboratories**

Maha-Metro has arranged “material testing lab” at Pune with facilities and procedures as per the international standards. All third party testing, validation, safety cum quality audit (as per the need and direction of Maha-Metro) for the contract covered in the present RFP shall be carried out in this lab and the cost of the testing shall be borne by the contractor. The said lab may also take up day to day testing of all civil works if the contractor desires so apart from witnessing calibration of various equipment and ‘onsite’ testing of ingredients involved in concreting. Transportation of samples/materials to the lab shall be arranged by the contractor at their own cost.

In case arrangement of “material testing lab” is not made available by Maha-Metro at any stage of contract, contractor may propose any NABL accredited third party testing lab for approval of engineer/employer before testing.



**APPENDIX 20**

**Deleted**

**APPENDIX 21**

**LOP of OHE Portals/masts**

**Shall be furnished to the successful bidder**

**APPENDIX 22**

**Deleted**

**APPENDIX 23**  
**LOP of Signaling Posts**

**Shall be furnished to the successful bidder**

**Appendix – 24**

**Geotechnical Data**

**Deleted**

**MAHARASHTRA METRO RAIL CORPORATION LIMITED****BID DOCUMENTS  
FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

TENDER NO. P1Misc-32/2024

PART 3:  
CONDITIONS OF CONTRACT AND CONTRACT FORMS

**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Contents of Part-III**

	<b><u>PART III: Conditions of Contract and Contract Forms</u></b>
1	Section VIII - General Condition (GC)
2	Section IX - Particular Condition (PC)
3	Annexure - IX-A- Dispute Board
4	Annexure - IX-B- Conciliation procedure
5	Section X- Contract Forms
6	Section XI- SHE Manuel

# MAHARASHTRA METRO RAIL CORPORATION LIMITED (CRF WORKS)

## BID DOCUMENTS

### FOR

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

TENDER NO. P1Misc-32/2024

Part-3: Conditions of Contract and Contract Forms  
Section -VIII: General Conditions of Contract (GC)



## Maharashtra Metro Rail Corporation Limited

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)



## General Conditions of Contract (GC)

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## **General Conditions of Contract (GC)**

The General Conditions that follow are based on the Conditions of Contract for Construction prepared and copyrighted by the International Federation of Consulting Engineers (*Federation Internationale des Ingenieurs-Conseils*, or FIDIC), FIDIC 2010 with required modification / correction & as per local working conditions, organizational requirement & keeping in view of law of land.

No part of this publication may be reproduced, translated, adapted, stored in a retrieval system or communicated, in any form or by any means, whether mechanical, electronic, magnetic, photocopying, recording or otherwise, without prior permission in writing from Maha-Metro, except by the Employer identified above and only for the exclusive purpose of preparing these Standard Bidding Documents for the Contract also identified above.

## General Conditions

### 1. General Provisions

<b>1.1 Definitions</b>	In the Conditions of Contract ("these Conditions"), which include <b>Particular Condition s</b> , and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.
<b>1.1.1 The Contract</b>	<p>1.1.1.1 "Contract" means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.</p> <p>1.1.1.2 "Contract Agreement" means the contract agreement referred to in Sub-Clause 1.6 [Contract Agreement].</p> <p>1.1.1.3 "Letter of Acceptance" means the letter of formal acceptance, signed by the Employer, of the Letter of Tender, including any annexed memoranda comprising agreements between and signed by both Parties. If there is no such letter of acceptance, the expression "Letter of Acceptance" means the Contract Agreement and the date of issuing or receiving the Letter of Acceptance means the date of signing the Contract Agreement.</p> <p>1.1.1.4 "Letter of Tender" means the document entitled letter of tender or letter of bid, which was completed by the Contractor and includes the signed offer to the Employer for the Works.</p> <p>1.1.1.5 "Specification" means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.</p> <p>1.1.1.6 "Drawings" means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract.</p> <p>1.1.1.7 "Schedules" means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bill of Quantities, data, lists, and schedules of rates and/or prices.</p>

	<p>1.1.1.8 "Tender" means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.</p> <p>1.1.1.9 "Bill of Quantities", "Day work Schedule" and "Schedule of Payment Currencies" mean the documents so named (if any) which are comprised in the Schedules.</p> <p>1.1.1.10 <b>"Particular Condition s"</b> means the pages completed by the Employer entitled <b>Particular Condition s</b> which constitute supplementation or modification or replacement of respective clause of General Condition of Contract (GC).</p>
<b>1.1.2 Parties and Persons</b>	<p>1.1.2.1 "Party" means the Employer or the Contractor, as the context requires.</p> <p>1.1.2.2 "Employer" means the person named as Employer in the <b>Particular Condition s</b> and the legal successors in title to this person.</p> <p>1.1.2.3 "Contractor" means the person(s) named as Contractor in the Letter of Tender accepted by the Employer and the legal successors in title to this person(s).</p> <p>1.1.2.4 "Engineer" means the person appointed by the Employer to act as the Engineer for the purposes of the Contract and named in the <b>Particular Condition s</b>, or other person appointed from time to time by the Employer and notified to the Contractor under Sub-Clause 3.4 [Replacement of the Engineer].</p> <p>1.1.2.5 "Contractor's Representative" means the person named by the Contractor in the Contract or appointed from time to time by the Contractor under Sub-Clause 4.3 [Contractor's Representative], who acts on behalf of the Contractor.</p> <p>1.1.2.6 "Employer's Personnel" means the Engineer, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer] and all other staff, labour and other employees of the Engineer and of the Employer; and any other personnel notified to the Contractor, by the Employer or the Engineer, as Employer's Personnel.</p> <p>1.1.2.7 "Contractor's Personnel" means the Contractor's Representative and all personnel whom the Contractor utilities on Site, who may include the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.</p>

	<p>1.1.2.8 "Sub Contractor" means any person named in the Contract as a Sub Contractor, or any person appointed as a Sub Contractor, for a part of the Works; and the legal successors in title to each of these persons.</p> <p>1.1.2.9 "DB" means the person or three persons appointed under Sub-Clause 20.2 [Appointment of the Dispute Board] or Sub-Clause 20.3 [Failure to Agree on the Composition of the Dispute Board]</p> <p>1.1.2.10 "FIDIC" means the Federation Internationale des Ingenieurs-Conseils, the International Federation of Consulting Engineers.</p> <p>1.1.2.11 "Bank" means the financing institution (if any) named in the <b>Particular Condition s</b>.</p> <p>1.1.2.12 "Borrower" means the person (if any) named as the borrower in the <b>Particular Condition s</b>.</p>
<b>1.1.3 Dates, Tests, Periods and Completion</b>	<p>1.1.3.1 "Base Date" means the date 28 days prior to the latest date for submission of the Tender.</p> <p>1.1.3.2 "Commencement Date" means the date notified under Sub-Clause 8.1 [Commencement of Works].</p> <p>1.1.3.3 "Time for Completion" means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [Time for Completion], as stated in the <b>Particular Condition s</b> (with any extension under Sub-Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date.</p> <p>1.1.3.4 "Tests on Completion" means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [Tests on Completion] before the Works or a Section (as the case may be) are taken over by the Employer.</p> <p>1.1.3.5 "Taking-Over Certificate" means a certificate issued under Clause 10 [Employer's Taking Over].</p> <p>1.1.3.6 "Tests after Completion" means the tests (if any) which are specified in the Contract and which are carried out in accordance with the Specification after the Works or a Section (as the case may be) are taken over by the Employer.</p> <p>1.1.3.7 "Defects Notification Period" means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects], which extends over 365 days except if</p>



	<p>otherwise stated in the <b>Particular Conditions</b> (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period]), calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1 [Taking Over of the Works and Sections]..</p> <p>1.1.3.8 "Performance Certificate" means the certificate issued under Sub-Clause 11.9 [Performance Certificate].</p> <p>1.1.3.9 "Day" means a calendar day and "year" means 365 days.</p>
<b>1.1.4 Money and Payments</b>	<p>1.1.4.1 "Accepted Contract Amount" means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.</p> <p>1.1.4.2 "Contract Price" means the price defined in Sub-Clause 14.1 [The Contract Price], and includes adjustments in accordance with the Contract.</p> <p>1.1.4.3 "Cost" means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.</p> <p>1.1.4.4 "Final Payment Certificate" means the payment certificate issued under Sub-Clause 14.13 [Issue of Final Payment Certificate].</p> <p>1.1.4.5 "Final Statement" means the statement defined in Sub-Clause 14.11 [Application for Final Payment Certificate].</p> <p>1.1.4.6 "Foreign Currency" means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.</p> <p>1.1.4.7 "Interim Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment], other than the Final Payment Certificate.</p> <p>1.1.4.8 "Local Currency" means the currency of the Country.</p> <p>1.1.4.9 "Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment].</p> <p>1.1.4.10 "Provisional Sum" means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [Provisional Sums].</p> <p>1.1.4.11 "Retention Money" means the accumulated retention moneys which the Employer retains under Sub-Clause 14.3 [Application for Interim Payment Certificates] and pays under Sub-Clause 14.9 [Payment of Retention Money].</p>

	1.1.4.12 "Statement" means a statement submitted by the Contractor as part of an application, under Clause 14 [Contract Price and Payment], for a payment certificate.
<b>1.1.5 Works and Goods</b>	<p>1.1.5.1 "Contractor's Equipment" means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Employer's Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.</p> <p>1.1.5.2 "Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.</p> <p>1.1.5.3 "Materials" means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.</p> <p>1.1.5.4 "Permanent Works" means the permanent works to be executed by the Contractor under the Contract.</p> <p>1.1.5.5 "Plant" means the apparatus, machinery and other equipment intended to form or forming part of the Permanent Works, including vehicles purchased for the Employer and relating to the construction or operation of the Works.</p> <p>1.1.5.6 "Section" means a part of the Works specified in the <b>Particular Conditions</b> as a Section (if any).</p> <p>1.1.5.7 "Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.</p> <p>1.1.5.8 "Works" mean the Permanent Works and the Temporary Works, or either of them as appropriate.</p>
<b>1.1.6 Other Definitions</b>	<p>1.1.6.1 "Contractor's Documents" means the Designs, calculations, computer programs and other software, soft &amp; hard copy of documents, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract.</p> <p>1.1.6.2 "Country" means the country specified in the <b>Particular Conditions</b> in which the Site (or most of it) is located, where the Permanent Works are to be executed.</p> <p>1.1.6.3 "Employer's Equipment" means the apparatus, machinery and vehicles (if any) made available by the Employer for the</p>

	<p>use of the Contractor in the execution of the Works, as stated in the Specification; but does not include Plant which has not been taken over by the Employer.</p> <p>1.1.6.4 "Force Majeure" is defined in Clause 19 [Force Majeure].</p> <p>1.1.6.5 "Laws" means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.</p> <p>1.1.6.6 "Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security].</p> <p>1.1.6.7 "Site" means the places mentioned in the <b>Particular Conditions</b> where the Permanent Works are to be executed, including storage and working areas, and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.</p> <p>1.1.6.8 "Unforeseeable" means not reasonably foreseeable by an experienced Contractor by the Base Date.</p> <p>1.1.6.9 "Variation" means any change to the Works, which is instructed or approved as a variation under Clause 13 [Variations and Adjustments].</p> <p>1.1.6.10 "Notice of Dissatisfaction" means the notice given by either Party to the other under Sub-Clause 20.4 [Obtaining Dispute Board's Decision] indicating its dissatisfaction and intention to commence arbitration.</p> <p>1.1.6.11 "Climatic Conditions" means General Metrological information mentioned in the <b>Particular Conditions</b></p>
<b>1.2 Interpretation</b>	<p>In the Contract, except where the context requires otherwise:</p> <p>(a) words indicating one gender include all genders;</p> <p>(b) words indicating the singular also include the plural and words indicating the plural also include the singular;</p> <p>(c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing;</p> <p>(d) "written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record; and</p> <p>(e) the word "tender" is synonymous with "bid" and "tenderer" with "bidder" and the words "tender documents" with "bidding documents"</p> <p>(f) The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.</p>

	<p>(g) In these Conditions, provisions including the expression "Cost plus profit" require this profit to be indicated in the <b>Particular Conditions</b>.</p>
<p><b>1.3 Communications</b></p>	<p>Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, these communications shall be:</p> <ul style="list-style-type: none"> <li>(a) in writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the <b>Particular Conditions</b>; and</li> <li>(b) delivered, sent or transmitted to the address for the recipient's communications as stated in the <b>Particular Conditions</b>. However: <ul style="list-style-type: none"> <li>(i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and</li> <li>(ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.</li> </ul> </li> </ul> <p>Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.</p>
<p><b>1.4 Law and Language</b></p>	<p>The Contract shall be governed by the law of the country or other jurisdiction stated in the <b>Particular Conditions</b>.</p> <p>The ruling language of the Contract shall be that stated in the <b>Particular Conditions</b>.</p> <p>The language for communications shall be that stated in the <b>Particular Conditions</b>. If no language is stated there, the language for communications shall be the ruling language of the Contract.</p>
<p><b>1.5 Priority of Documents</b></p>	<p>The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:</p> <ul style="list-style-type: none"> <li>(a) the Contract Agreement (On appropriate Stamp Paper).</li> <li>(b) the Letter of Acceptance (LOA)</li> <li>(c) Accepted Financial Bid &amp; Bill of Quantities</li> </ul>

	<p>(d) Corrigendum/ Addendum/ Clarifications</p> <p>(e) the Particular Condition of Contract (PCC)</p> <p>(f) the General Conditions (GC)</p> <p>(g) the Work Specification &amp; Employer's Requirement,</p> <p>(h) the Drawings,</p> <p>(i) Contractor's Submissions</p> <p>U) and any other reference documents forming part of the Contract.</p> <p>If an ambiguity or discrepancy is found in the documents, the Employer shall issue any necessary clarification or instruction by approval of competent authority.</p>
<b>1.6 Contract Agreement</b>	<p>The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the <b>Particular Conditions</b> establish otherwise. The Contract Agreement shall be based upon the Form annexed to the <b>Particular Conditions</b>.</p> <p><b>The costs of stamp duties and similar charges (if any) imposed by law and as per Stamp Duty Act (amended from time to time) of state in which the work is executed, in connection to entering into the Contract Agreement, shall be borne by the Contractor.</b></p>
<b>1.7 Assignment</b>	<p>Contractor shall not assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, the Employer:</p> <p>(a) may assign the whole or any part of the work, in event of exceptionally slow progress due to delay attributed to Contractor or poor quality ( in accordance with Sub Clause 15.2 (g) ) , and</p> <p>(b) may, as security in favour of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.</p>
<b>1.8 Care and Supply of Documents</b>	<p>The Specification and Drawings shall be in the custody and care of the Employer. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.</p> <p>Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Employer. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer six copies of each of the Contractor's Documents.</p> <p>The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents</p>

	<p>(if any), the Drawings and Variations and other communications given under the Contract. The Employer's Personnel shall have the right of access to all these documents at all reasonable times.</p> <p>If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.</p>
<b>1.9 (a) Delayed Drawings or Instructions</b>	<p>The Contractor shall give notice to the Engineer whenever the Works are likely to be delayed or disrupted if any necessary drawing or instruction is not issued to the Contractor within a particular time, which shall be reasonable. The notice shall include details of the necessary drawing or instruction, details of why and by when it should be issued, and the nature and amount of the delay or disruption likely to be suffered if it is late.</p> <p>If the Contractor suffers delay as a result of a failure of the Engineer to issue the notified drawing or instruction within a time which is reasonable and is specified in the notice with supporting details, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an <b>extension of time only</b>, for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion].</p> <p>After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p> <p>However, if and to the extent that the Engineer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.</p>
<b>1.9 (b) Errors in Employer's Requirement</b>	<p>If the Contractor suffers delay and/or incurs Cost as a result of an error in the Employer's Requirements, and an experienced Contractor exercising due care would not have discovered the error when scrutinizing the Employer's Requirements under Section -VII , Part-2, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p> <p>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</p> <p>(b) payment of any such Cost plus reasonable profit towards addition in work requirement (if any) or additional cost implication in amendment / corrections in Employers Requirement , which shall be estimated / evaluated by Engineer and included in the Contract</p>

	<p>Price. After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been so discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.</p>
<p><b>1.10 Employer's Use of Contractor's Documents</b></p>	<p>As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.</p> <p>The Contractor shall be deemed (by signing the Contract) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This licence shall:</p> <p>(a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,</p> <p>(b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and in the case of Contractor's Documents which are in the form of computer programs or soft copy and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.</p>
<p><b>1.11 Contractor's Use of Employer's Documents</b></p>	<p>As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Specification, the Drawings software, soft copy of documents, digital format of document and other documents made by (or on behalf of) the Employer. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not, without the Employer's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.</p>
<p><b>1.12 Confidential Details</b></p>	<p>The Contractor's and the Employer's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify compliance with the Contract and allow its proper implementation. Each of them shall treat the details of the Contract as private and confidential, except to the extent necessary to carry out their respective obligations under the Contract or to comply with applicable Laws. Contractor shall not publish or disclose any</p>

	<p>particulars of the Works prepared by the either Party without the previous agreement of the Employer.</p> <p>However, the Contractor shall be permitted to disclose any publicly available information on public domain, or information otherwise required to establish his qualifications to compete for other projects.</p>
<b>1.13 Compliance with Laws</b>	<p>The Contractor shall, in performing the Contract, comply with applicable Laws. Unless otherwise stated in the <b>Particular Conditions</b>:</p> <ul style="list-style-type: none"> <li>(a) the Employer shall have obtained (or shall obtain) the planning, zoning, building permit or similar permission for the Permanent Works, and any other permissions described in the Specification as having been (or to be) obtained by the Employer; and the Employer shall indemnify and hold the Contractor harmless against and from the consequences of any failure to do so; and</li> <li>(b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all permits, licenses and approvals, as required by the Laws in relation to the execution and completion of the Works and the remedying of any defects; and the Contractor shall indemnify and hold the Employer harmless against and from the consequences of any failure to do so, unless the Contractor is impeded to accomplish these actions and shows evidence of its diligence.</li> </ul>
<b>1.14 Joint and Several Liability</b>	<p>If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:</p> <ul style="list-style-type: none"> <li>(a) these persons shall be deemed to be jointly and severally liable to the Employer for the performance of the Contract;</li> <li>(b) these persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and</li> <li>(c) the Contractor shall not alter its composition or legal status without the prior consent of the Employer.</li> </ul>
<b>1.15 Inspections and Audit by the Bank/ Funding Entity</b>	<p>The Contractor shall permit the Bank/ Funding Entity and /or persons appointed by the Bank/ Funding Entity to inspect the Site and/or the Contractor's accounts and records relating to the performance of the Contract and to have such accounts and records audited by auditors appointed by the Bank/ Funding Entity, if required by the Bank.</p>



## 2. The Employer

<p><b>2.1 Right of Access to the Site</b></p>	<p>After award of the work, The Engineer shall grant the Contractor right of access to, and /or possession of, the Site progressively for the completion of Works. Such right and possession may not be exclusive to the Contractor. The Contractor will draw/ modify the schedule for completion of Works according to progressive possession / right of such sites.</p> <p>If the Contractor suffers delay from failure on the part of the Employer to grant right of access to, or possession of the Site, the Contractor shall give notice to the Engineer in a period of 28 days of such occurrence.</p> <p>After receipt of such notice the Engineer shall proceed to determine any extension of time to which the Contractor is entitled and shall notify the Contractor accordingly.</p> <p>For any such delay in handing over of site, Contractors will be entitled to only reasonable extension of time Sub-Clause 8.4 [Extension of Time for Completion] and no monetary claims whatsoever shall be paid or entertained on this account.</p> <p>The Access Dates shown in the Works Requirements are for planning purposes only.</p> <p>The Engineer reserves the right to make each site available to the Contractor any time before or after the Access Dates. The Engineer will notify the Contractor of the actual Access Dates in advance for each part of the works. This Notice will specify the area to which it refers is accessible and in a sufficient state of completion to permit the Contractor to begin installation and testing therein. It shall not imply that the Contractor will enjoy exclusive use of the area or that the work of other Contractor's therein is complete. The Contractor shall begin installation in each area by the actual Access Date, and shall complete all installation and testing in each area by the relevant Key Date (If Any)</p> <p>Notwithstanding the actual Access Date, whether before or after the stipulated Access Dates, the Employer shall not accept any increase in cost to the Employer.</p>
<p><b>2.2 Permits, Licenses or Approvals</b></p>	<p>The Employer shall provide, at the request of the Contractor, such reasonable assistance as to allow the Contractor to obtain properly:</p> <ul style="list-style-type: none"> <li>(a) copies of the Laws of the Country which are relevant to the Contract but are not readily available, and</li> <li>(b) any permits, licenses or approvals required by the Laws of the Country:</li> </ul>

	<ul style="list-style-type: none"> <li>(i) which the Contractor is required to obtain under Sub-Clause 1.13 [Compliance with Laws],</li> <li>(ii) for the delivery of Goods, including clearance through customs, and other statutory authorities, local administrative bodies</li> <li>(iii) for the export of Contractor's Equipment when it is removed from the Site.</li> </ul>
<b>2.3 Employer's Personnel</b>	<p>The Employer shall be responsible for ensuring that the Employer's Personnel and the Employer's other Contractors on the Site:</p> <ul style="list-style-type: none"> <li>(a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [Co-operation], and</li> <li>(b) take actions similar to those which the Contractor is required to take under sub-paragraphs (a), (b) and (c) of Sub-Clause 4.8 [Safety Procedures] and under Sub-Clause 4.18 [Protection of the Environment].</li> </ul>
<b>2.4 Employer's Financial Arrangements</b>	<p>The Employer shall ensure the adequacy of fund &amp; financial support for payment to Contractor &amp; completion of the work, prior to commencement of work. The details may be made public or communicated to Contractor at the discretion of Employer.</p>
<b>2.5 Employer's Claims</b>	<p>If the Employer considers himself to be entitled to any payment under any Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Notification Period, the Employer or the Engineer shall give notice and particulars to the Contractor. However, notice is not required for payments due under Sub-Clause 4.19 [Electricity, Water and Gas], under Sub-Clause 4.20 [Employer's Equipment and Free-Issue Materials], or for other services requested by the Contractor.</p> <p>The notice shall be given as soon as practicable and no longer than 28 days after the Employer became aware, or should have become aware, of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given before the expiry of such period.</p> <p>The particulars shall specify the Clause or other basis of the claim, and shall include substantiation of the amount and/or extension to which the Employer considers himself to be entitled in connection with the Contract. The Engineer shall then proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the amount (if any) which the Employer is entitled to be paid by the Contractor, and/or (ii) the extension (if any) of the Defects Notification Period in</p>

	<p>accordance with Sub-Clause 11.3 [Extension of Defects Notification Period].</p> <p>This amount may be included as a deduction in the Contract Price and Payment Certificates. The Employer shall only be entitled to set off against or make any deduction from an amount certified in a Payment Certificate, or to otherwise claim against the Contractor, in accordance with this Sub-Clause.</p>
<b>3. The Engineer</b>	
<b>3.1 Engineer's Duties and Authority</b>	<p>The Employer shall appoint the Engineer who shall carry out the duties assigned to him in the Contract. The Engineer's staff shall include suitably qualified Engineers and other professionals who are competent to carry out these duties.</p> <p>The Engineer shall have no authority to amend the Contract.</p> <p>The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. If the Engineer is required to obtain the approval of the Employer before exercising a specified authority, the requirements shall be as stated in the <b>Particular Conditions</b>. The Employer shall promptly inform the Contractor of any change to the authority attributed to the Engineer.</p> <p>However, whenever the Engineer exercises a specified authority for which the Employer's approval is required, then (for the purposes of the Contract) the Employer shall be deemed to have given approval.</p> <p>Except as otherwise stated in these Conditions:</p> <ul style="list-style-type: none"> <li>(a) whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer shall be deemed to act for the Employer;</li> <li>(b) the Engineer has no authority to relieve either Party of any duties, obligations or responsibilities under the Contract;</li> <li>(c) any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions, discrepancies and non-compliances; and</li> <li>(d) any act by the Engineer in response to a Contractor's request except as otherwise expressly specified shall be notified in writing to the Contractor within 28 days of receipt.</li> </ul> <p>The following provisions shall apply:</p>

	<p>The Engineer shall obtain the specific approval of the Employer before taking action under the-following Sub-Clauses of these Conditions:</p> <ul style="list-style-type: none"> <li>(a) Sub-Clause 4.12: agreeing or determining an extension of time and /or additional cost.</li> <li>(b) Sub-Clause 13.1: instructing a Variation, except; <ul style="list-style-type: none"> <li>(i) in an emergency situation as determined by the Engineer,</li> <li style="text-align: center;">or</li> <li>(ii) if such a Variation would increase the Accepted Contract Amount as per provision of <b>Particular Conditions</b>, subjected to approval of Employer, as the case may be.</li> </ul> </li> <li>(c) Sub-Clause 13.3: Approving a proposal for Variation submitted by the Contractor in accordance with Sub Clause 13.1 or 13.2.</li> <li>(d) Sub-Clause 13.4: Specifying the amount payable in each of the applicable currencies</li> </ul> <p>Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contractor to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Employer, with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 and shall notify the Contractor accordingly, with a copy to the Employer.</p>
<b>3.2 Delegation by the Engineer</b>	<p>The Engineer may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation. These assistants may include a resident Engineer, and/or independent inspectors appointed to inspect and/or test items of Plant and/or Materials. The assignment, delegation or revocation shall be in writing and shall not take effect until copies have been received by both Parties. However, unless otherwise agreed by both Parties, the Engineer shall not delegate the authority to determine any matter in accordance with Sub-Clause 3.5 [Determinations].</p> <p>Each assistant, to whom duties have been assigned or authority has been delegated, shall only be authorized to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by an assistant, in</p>

	<p>accordance with the delegation, shall have the same effect as though the act had been an act of the Engineer. However:</p> <ul style="list-style-type: none"> <li>(a) any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Engineer to reject the work, Plant or Materials;</li> <li>(b) if the Contractor questions any determination or instruction of an assistant, the Contractor may refer the matter to the Engineer, who shall promptly confirm, reverse or vary the determination or instruction.</li> </ul>
<b>3.3 Instructions of the Engineer</b>	<p>The Engineer may issue to the Contractor (at any time) instructions and additional or modified Drawings which may be necessary for the execution of the Works and the remedying of any defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer, or from an assistant to whom the appropriate authority has been delegated under this Clause. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.</p> <p>The Contractor shall comply with the instructions given by the Engineer or delegated assistant, on any matter related to the Contract. Whenever practicable, their instructions shall be given in writing. If the Engineer or a delegated assistant:</p> <ul style="list-style-type: none"> <li>(a) gives an oral instruction,</li> <li>(b) receives a written confirmation of the instruction, from (or on behalf of) the Contractor, within two working days after giving the instruction, and</li> <li>(c) does not reply by issuing a written rejection and/or instruction within two working days after receiving the confirmation,</li> </ul> <p>then the confirmation shall constitute the written instruction of the Engineer or delegated assistant (as the case may be).</p>
<b>3.4 Replacement of the Engineer</b>	<p>If the Employer intends to replace the Engineer, the Employer shall, not less than 21 days before the intended date of replacement, give notice to the Contractor of the name, address and relevant experience of the intended replacement Engineer. If the Contractor considers the intended replacement Engineer to be unsuitable, he has the right to raise objection against him by notice to the Employer, with supporting particulars, and the Employer shall give full and fair consideration to this objection.</p>
<b>3.5 Determinations</b>	<p>Whenever these Conditions provide that the Engineer shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter, the Engineer shall consult with each Party in an endeavor to</p>

	<p>reach agreement. If agreement is not achieved, the Engineer shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.</p> <p>The Engineer shall give notice to both Parties of each agreement or determination, with supporting particulars, within 28 days from the receipt of the corresponding claim or request except when otherwise specified. Each Party shall give effect to each agreement or determination unless and until revised under Clause 20 [Claims, Disputes and Arbitration].</p>
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#### 4. The Contractor

<p><b>4.1 Contractor's General Obligations</b></p>	<p>The Contractor shall design (to the extent specified in the Contract), execute and complete the Works in accordance with the Contract and with the Engineer's instructions, and shall remedy any defects in the Works.</p> <p>The Contractor shall provide the Plant and Contractor's Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.</p> <p>All equipment, material, and services to be incorporated in or required for the Works shall have their origin in any eligible source country as defined by the Bank.</p> <p>The Contractor shall be responsible for the adequacy, stability and safety of all Site operations and of all methods of construction. Except to the extent specified in the Contract, the Contractor (i) shall be responsible for all Contractor's Documents, Temporary Works, and such design of each item of Plant and Materials as is required for the item to be in accordance with the Contract, and (ii) shall not otherwise be responsible for the design or specification of the Permanent Works.</p> <p>The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer.</p> <p>If the Contract specifies that the Contractor shall design any part of the Permanent Works, then unless otherwise stated in the Particular Condition s:</p> <ul style="list-style-type: none"> <li>(a) the Contractor shall submit to the Engineer the Contractor's Documents for this part in accordance with the procedures specified in the Contract;</li> <li>(b) these Contractor's Documents shall be in accordance with the Specification and Drawings, shall be written in the language for communications defined in Sub-Clause 1.4 [Law and Language], and shall include additional information required by the Engineer to add to the Drawings for co-ordination of each Party's designs;</li> <li>(c) the Contractor shall be responsible for this part and it shall, when the Works are completed, be fit for such purposes for which the part is intended as are specified in the Contract; and</li> <li>(d) prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer the "as-built" documents</li> </ul>
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	<p>and, if applicable, operation and maintenance manuals in accordance with the Specification and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until these documents and manuals have been submitted to the Engineer.</p> <p>(e) The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact "as-built" locations, sizes and details of the Works as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause. Six copies shall be submitted to the Engineer prior to the commencement of the Tests on Completion.</p> <p>(f) Prior to the issue of any Taking Over Certificate, the Contractor shall submit to the Engineer one microfilm / soft copy, one full-size original copy and six printed copies of the relevant "as-built drawings", and any further Construction and/or Manufacture Documents specified in the Works Requirements. The Works shall not be considered to be completed for the purposes of Taking Over under Clause 10 until such documents have been submitted to the Engineer.</p> <p>(g) Prior to commencement of the Tests on Completion, the Contractor shall prepare, and submit to the Engineer, Operation and Maintenance Manuals in accordance with the Works Requirements and in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Works. The Works shall not be considered to be completed for the purposes of Taking Over under Clause 10 until such Operation and Maintenance Manuals have been submitted to the Engineer and received his consent.</p> <p>(h) The Operation and Maintenance Manuals and drawings submitted by the Contractor shall be updated by him during the Defects Liability Period and the Contractor shall re-submit the updated manuals at the end of the OLP for review and acceptance by the Engineer.</p>
<b>4.2 Performance Security</b>	<p>The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount stated in the <b>Particular Conditions</b> Of Contract and denominated in the currency (ies) of the Contract or in a freely convertible currency acceptable to the</p>



	<p>Employer. If an amount is not stated in the Particular Condition ss of Contract, this Sub-Clause shall not apply.</p> <p>The Contractor shall deliver the Performance Security to the Employer within 28 days after receiving the <b>Letter of Acceptance</b>, and shall send a copy to the Engineer. The Performance Security shall be issued by a scheduled commercial bank of Indian Origin or Schedule Commercial Bank Foreign origin (Except Cooperative Bank) having business office in India, acceptable to the Employer, and shall be in the form annexed to <b>Contract Forms in Section X</b>, as stipulated by the Employer in the Particular Condition Of Contract, or in another form approved by the Employer.</p> <p>The Contractor shall ensure that the Performance Security is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects during DLP and 60 (Sixty) days beyond DLP. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.</p> <p>The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract in the event of:</p> <ul style="list-style-type: none"> <li>(a) failure by the Contractor to extend the validity of the Performance Security as described in the preceding paragraph, in which event the Employer may claim the full amount of the Performance Security,</li> <li>(b) failure by the Contractor to pay the Employer an amount due, as either agreed by the Contractor or determined under Sub-Clause 2.5 [Employer's Claims] or Clause 20 [Claims, Disputes and Arbitration], within 42 days after this agreement or determination,</li> <li>(c) failure by the Contractor to remedy a default within 42 days after receiving the Employer's notice requiring the default to be remedied,</li> <li>(d) Any act or work of contractor, which leads to the breach of contract.</li> <li>(e) Circumstances which entitle the Employer to termination under Sub-Clause 15.2 [Termination by Employer], irrespective of whether notice of termination has been given.</li> </ul>
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	<p>The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.</p> <p><b>The Employer shall return the Performance Security to the Contractor within 60 (Sixty) days after receiving a copy of the Performance Certificate. (i.e. successful completion of Defect Liability Period (DLP), if any)</b></p> <p>Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer determines an addition or a reduction to the Contract Price as a result of a change in cost and/or legislation, or as a result of a Variation, amounting to more than 25 percent of the portion of the Contract Price payable in a specific currency, the Contractor shall at the Engineer's request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.</p> <p><b>Note:</b> - In case the Performance Security is in the form of other than Bank Guarantee the detail is specifically mentioned in Particular Condition of Contract &amp; the same shall prevail.</p>
<p><b>4.3 Contractor's Representative</b></p>	<p>The Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract.</p> <p>Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Engineer for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked in terms of Sub-Clause 6.9 [Contractor's Personnel], or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment.</p> <p>The Contractor shall not, without the prior consent of the Engineer /Employer, revoke the appointment of the Contractor's Representative or appoint a replacement.</p> <p>The whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement person shall be appointed, subject to the Engineer's prior consent, and the Engineer shall be notified accordingly.</p>

	<p>The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.3 [Instructions of the Engineer].</p> <p>The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.</p> <p>The Contractor's Representative shall be fluent in the language for communications defined in Sub-Clause 1.4 [Law and Language]. If the Contractor's Representative's delegates are not fluent in the said language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.</p>
<b>4.4 Sub-Contractors</b>	<p>The Contractor shall not subcontract the whole of the Works.</p> <p>The Contractor shall be responsible for the acts or defaults of any Sub Contractor, his agents or employees, as if they were the acts or defaults of the Contractor. Unless otherwise stated in the Particular Condition s:</p> <ul style="list-style-type: none"> <li>(a) the Contractor shall not be required to obtain consent to suppliers solely of Materials, or to a subcontract for which the Subcontractor is named in the Contract;</li> <li>(b) the prior consent of the Engineer shall be obtained to other proposed Sub Contractors;</li> <li>(c) the Contractor shall give the Engineer not less than 28 days' notice of the intended date of the commencement of each Subcontractor's work, and of the commencement of such work on the Site; and</li> <li>(d) each subcontract shall include provisions which would entitle the Employer to require the subcontract to be assigned to the Employer under Sub-Clause 4.5 [Assignment of Benefit of Subcontract] (if or when applicable) or in the event of termination under Sub-Clause 15.2 [Termination by Employer]</li> <li>(e) Sub-contracting of works shall be limited to 50% of the awarded cost of the work. The terms and conditions of subcontracts and the payments that have to be made to the Sub Contractors shall be the sole responsibility of the Contractor. However, the Sub Contractor / Vendor shall fully comply with the technical specifications included in the Works Requirements and other contractual obligations with the main Contractor.</li> </ul>

	<p>(f) The Contractor shall not be required to provide to the Engineer the details of the pricing of their Sub-contracts.</p> <p>(g) For sub-contracts exceeding Rs 5 million each, it will be obligatory for the Contractor to obtain a "Notice of No-Objection" from the Engineer, for selection of the Sub-Contractor and Vendor. The Contractor shall submit the full detail of sub-Contractor and tasks proposed to be assigned, along with application of NOC. The Contractor shall certify that the cumulative value of the subcontracts (including those up to Rs 5 million each) awarded is within the aforesaid 50% limit. Any proposals by the Bidders in their offer shall not be construed as an approval of the vendor.</p> <p>(h) The Contractor shall provide sufficient superintendence, whether on the site or elsewhere, to ensure that the work to be carried out by a Sub-Contractor complies with the requirements of the Contract.</p> <p>(i) Notwithstanding any consent to sub-contract given by the Engineer, if in his opinion it is consider necessary, the Engineer shall have full authority to order the removal of any sub-Contractor from the Site or off-Site, place of construction/fabrication or storage.</p> <p>U) The Contractor shall ensure that their sub-Contractors, material / equipment suppliers and other agencies deployed by them in connection with execution of the Contract do not make any claim or raise any dispute before Employer. For this, necessary provision shall be made in the agreement between Contractor and their Sub Contractors / other agencies. Similarly the agreement should also incorporate the provision of dispute resolution. An <i>Undertaking</i> in this regard shall be furnished in the <b>"Form-13"</b> provided in <b>Section-X: Contract Form</b>.</p> <p>(k) Employer is not responsible for payment of any dues, claims of Sub-Contractor of Contractor.</p> <p>(l) The Contractor shall ensure that the requirements imposed on the Contractor by Sub-Clause 1.12 [Confidential Details] apply equally to each Sub Contractor.</p> <p>(m) Where practicable, the Contractor shall give fair and reasonable opportunity for Sub-Contractors from within the Country.</p>
<b>4.5 Assignment of Benefit of Subcontract</b>	<p>If a Subcontractor's obligations extend beyond the expiry date of the relevant Defects Notification Period and the Engineer, prior to this date, instructs the Contractor to assign the benefit of such obligations to the Employer, then the Contractor shall do so. Unless otherwise stated in the assignment, the Contractor shall have no liability to the</p>

	Employer for the work carried out by the Sub Contractor after the assignment takes effect.
<b>4.6 Co-operation</b>	<p>The Contractor shall, as specified in the Contract or as instructed by the Engineer, allow appropriate opportunities for carrying out work to:</p> <ul style="list-style-type: none"> <li>(a) the Employer's Personnel,</li> <li>(b) any other Contractors employed by the Employer, and</li> <li>(c) the personnel of any legally constituted public authorities,</li> </ul> <p>who may be employed in the execution on or near the Site of any work not included in the Contract.</p> <p>The Contractor shall be responsible for his construction activities on the Site, and shall co-ordinate his own activities with those of other contractors to the extent (if any) specified in the Employer's Requirements.</p> <p>If, under the Contract, the Employer is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such documents to the Engineer in the time and manner stated in the Specification</p>
<b>4.7 Setting Out</b>	<p>The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contract or notified by the Engineer. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall verify &amp; rectify any error in the positions, levels, dimensions or alignment of the Works.</p> <p>The Engineer shall be responsible for any errors, in these specified or notified items of reference (if the design, drawing is supplied by Employer/ Engineer), but the Contractor shall use reasonable efforts to verify their accuracy before they are used and corrective measures shall be taken by Contractor accordingly.</p> <p>In Contract, where the Design is entirely in the scope of Contractor, the Contractor shall be responsible for any error &amp; its further consequences.</p> <p>If the Contractor suffers delay and/or incurs Cost from executing work which was necessitated by an error in these items of reference (due to reasons whatsoever), and Contractor could not reasonably have discovered such error and avoided this delay and/or Cost, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of time only for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</p>

	After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been discovered, and (ii) the matters described above.
<b>4.8 Safety Procedures</b>	<p><b>The Contractor shall:</b></p> <ul style="list-style-type: none"> <li>(i) comply with all applicable safety regulations,</li> <li>(ii) take care for the safety of all persons entitled to be on the Site,</li> <li>(iii) use reasonable efforts to keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons,</li> <li>(iv) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause 10 [Employer's Taking Over], and</li> <li>(v) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.</li> <li>(vi) Within 8 weeks of the date of Notice to Proceed, the Contractor shall submit a detailed and comprehensive contract-specific Site Safety Plan based on the Employer's Safety, Health and Environment Manual (SHE Manual). The Contractor is required to make himself aware of all the requirements of the Employer's Safety, Health and Environment Manual in this regard and comply with them. The Site Safety Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance with Sub-Clauses 4.8 and 6.7 of General Conditions of Contract.</li> <li>(vii) The Contractor shall, from time to time and as necessary or required by the Engineer, produce supplements to the Site Safety Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety and industrial health obligations, responsibilities, policies and procedures (under the laws of India) or as stated in the Contract or elsewhere relating to work on Site.</li> <li>(viii) If at any time the Site Safety Plan is, in the opinion of the Engineer, insufficient or requires revision or modification to ensure the security of the Works and the safety of all workmen upon, and visitors to the Site, the Engineer may instruct the Contractor to revise the Site Safety Plan. The Contractor shall, within 14 days, submit the revised plan to the Engineer for review.</li> </ul>

	<p>(ix) Any omission, inconsistency or error in the Site Safety Plan or the Engineer concurrence or rejection of the Site Safety Plan and/or supplements thereto shall be without prejudice to the Contractor's obligations with respect to site safety and industrial health and shall not excuse any failure by the Contractor to adopt proper and recognized safety practices throughout the execution of the Works.</p> <p>(x) The Contractor shall adhere to the Site Safety Plan and shall ensure, that all sub-Contractors of all tiers have a copy of the Site Safety Plan and comply with its provisions.</p> <p>(xi) The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer and the Employer to carry out surveillance to verify that the Site Safety Plan is being properly and fully implemented.</p> <p>(xii) The Contractor shall notify the Engineer immediately of any occurrence or incident that results in death or serious injury as defined in the Indian Penal Code. Such initial notification may be verbal and confirmed in writing thereafter and shall be followed by a comprehensive written report within 24 hours of the occurrence/incident. The Contractor shall duly complete standard forms as required by the Engineer and Statutory Authorities.</p> <p>(xiii) The Contractor shall provide and maintain all necessary temporary fire protection and firefighting facilities on the Site during the construction of the Works in accordance with the statutory regulations and as required by the Engineer. The Contractor shall ensure that all gases, fuels and other dangerous Materials and goods are stored and handled in a safe manner and in accordance with the statutory regulations and as required by the Engineer.</p> <p><b>(xiv)</b> The obligations and requirements for safety and industrial health under this Contract are entirely without prejudice to, and do not derogate from, the Contractor's statutory obligations, with respect to safety and industrial health.</p> <p>(xv) Contractor is required to take note of all the necessary provisions in Employer's Safety, Health and Environment Manual (SHE Manual) and the Contractor's price shall be inclusive of all the necessary costs to meet the prescribed safety standards. In the case, the Contractor fails in the above; the Employer may provide the necessary arrangements and recover the costs from the Contractor.</p>
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	<p>(xvi) The Contractor shall submit a detailed and comprehensive contract-specific Site Safety Plan and System Safety Assurance Plan in accordance with the provisions in Employer's Safety, Health &amp; Environment (SHE) Manual and Employer's Requirements.</p> <p>(xvii) where any work would otherwise be carried out in darkness, ensure that all parts of the Site where work is being carried out are so lighted as to ensure the safety &amp; Security of all persons on or in the vicinity of the Site and of such work.</p> <p>(xviii) The Contractor shall, from time to time and as necessary or required by the Engineer, produce supplements to the Site Safety and System Safety Assurance Plans such that they are at all times detailed, comprehensive and contemporaneous statements by the Contractor of his site safety measures, policies and procedures (under the laws of India) or as stated in the Contract or elsewhere.</p> <p>(xix) If at any time the Site Safety Plan and/or System Safety Assurance Plan is, in the Engineer's opinion, insufficient or requires revision or modification, the Engineer may instruct the Contractor to revise the appropriate Plan. The Contractor shall, within fourteen days, submit the revised plan to the Engineer for review.</p> <p>(xx) Any omission, inconsistency or error in the Safety Plans or the Engineer's consent or rejection of the Safety Plans and/or supplements thereto shall be without prejudice to the Contractor's obligations with respect to safety measures and shall not excuse any failure by the Contractor to adopt proper and recognized safety practices throughout the execution of the Works.</p> <p>(xxi) have full regard for the safety of all persons on or in the vicinity of the Site (including without limitation persons to whom access to the Site has been allowed by the Contractor), comply with all relevant safety regulations, including provision of safety gear, and insofar as the Contractor is in occupation or otherwise is using areas of the Site, keep the Site and the Works (so far as the same are not completed and occupied by the Employer) in an orderly state appropriate to the avoidance of injury to all persons and shall keep the Employer indemnified against all injuries to such person</p>
<b>4.9 Quality Assurance</b>	The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The



	<p>system shall be in accordance with the details stated in the Contract. The Engineer shall be entitled to audit any aspect of the system.</p> <p>Details of all procedures and compliance documents shall be submitted to the Engineer for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor himself shall be apparent on the document itself.</p> <p>Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.</p>
<b>4.10 Site Data</b>	<p>The Employer shall have made available to the Contractor with the Bidding documents such relevant data/ studies/ reports/ technical information in Employer's possession. The accuracy or reliability of the data/ studies/ reports/ technical information and of any other information supplied at the time of bidding by the Employer or Engineer is not warranted with respect to the viability of his execution of Works and the Contractor shall be responsible for verifying and interpreting all such data.</p> <p>The Contractor shall conduct further investigations considered necessary by him at his own cost and any error, discrepancies if found in Employer's data at any stage will not constitute ground for any claim for extra time and costs.</p> <p>The Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works.</p> <p>The Contractor shall also be deemed to have inspected and examined the Site, its surroundings, the above data and other available information with respect to the viability of his design and execution of Works and to have satisfied himself before submitting the Tender, as to all the relevant matters including without limitation:</p> <ol style="list-style-type: none"> <li>a) the climatic conditions;</li> <li>b) the hydrological conditions and the form and nature of the Site, including Sub-Surface conditions</li> <li>c) the extent and nature of the work, Plant, and Materials necessary for the execution and completion of the Works and the remedying of any defects;</li> <li>d) the applicable laws, procedures and labour practices</li> <li>e) The Contractor's requirement for access, accommodation, facilities, personnel, power, transport and other services</li> <li>f) the risk of injury or damage to property adjacent to the Site and to the occupiers of such property or any other risk.</li> </ol>

<p><b>4.11 Sufficiency of the Accepted Contract Amount</b></p>	<p>The Contractor shall be deemed to:</p> <ul style="list-style-type: none"> <li>(a) have satisfied himself as to the correctness and sufficiency of the Accepted Contract Amount, and</li> <li>(b) have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [Site Data].</li> </ul> <p>Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper execution and completion of the Works and the remedying of any defects.</p>
<p><b>4.12 Unforeseeable Physical Conditions</b></p>	<p>In this Sub-Clause, "physical conditions" means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.</p> <p>If the Contractor encounters adverse physical conditions which he considers to have been Unforeseeable, the Contractor shall give notice to the Engineer as soon as practicable.</p> <p>This notice shall describe the physical conditions, so that they can be inspected by the Engineer, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as are appropriate for the physical conditions, and shall comply with any instructions, which the Engineer may give. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.</p> <p>If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/or incurs Cost due to these conditions, the Contractor shall be entitled subject to notice under Sub-Clause 20.1 [Contractor's Claims] to</p> <ul style="list-style-type: none"> <li>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion].</li> <li>(b) payment of any such cost, which shall be included in the Contract Price</li> </ul> <p>Upon receiving such notice and inspecting and /or investigating these physical conditions, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and</p>

	<p>(if so) to what extent these physical conditions were Unforeseeable, and (ii) the matters described above related to this extent.</p> <p>The Engineer shall take account of any evidence of the physical conditions foreseen by the Contractor when submitting the Tender, which shall be made available by the Contractor, but shall not be bound by the Contractor's interpretation of any such evidence.</p>
<b>4.13 Rights of Way and Facilities</b>	<p>Unless otherwise specified in the Contract the Employer shall provide effective access to and possession of the Site including special and/or already available temporary access and rights-of-way which are necessary for the Works.</p> <p>The Contractor shall obtain / construct, at his risk and cost, any additional rights of way or facilities outside the Site which he may require for the purposes of the Works.</p>
<b>4.14 Avoidance of Interference</b>	<p>The Contractor shall not interfere unnecessarily or improperly with:</p> <ul style="list-style-type: none"> <li>(a) the convenience of the public, or</li> <li>(b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others.</li> <li>(c) Shall not interfere in smooth functioning of traffic &amp; shall make suitable arrangement at his own cost to segregate it from the working area without causing any safety concern of common people.</li> </ul> <p>The Contractor shall indemnify and hold the Employer harmless against and from all damages, losses, claims and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.</p>
<b>4.15 Access Route</b>	<p>The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site at Base Date. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes.</p> <p>Except as otherwise stated in these Conditions:</p> <ul style="list-style-type: none"> <li>(a) the Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;</li> <li>(b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may</li> </ul>

	<p>be required from the relevant authorities for his use of routes, signs and directions;</p> <p>(c) the Employer shall not be responsible for any claims which may arise from the use or otherwise of any access route;</p> <p>(d) the Employer does not guarantee the suitability or availability of particular access routes; and</p> <p>(e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.</p> <p>(f) All operations for the execution of the Works shall be carried out so as not to interfere unnecessarily with the convenience of the public or the access to public or private roads or footpaths or properties owned by the Employer or by any other person. The Contractor shall select routes, choose and use such vehicles so that movement of Contractor's Equipment, Plant and Materials from and to the Site is so limited that traffic is not delayed and damage to highways and bridges is prevented. If there is any delay or damage or injury, the cost of rectification or reconstruction of highways or bridges shall be borne by the Contractor. The Contractor shall indemnify the Employer in respect of all claims, demands, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters.</p> <p>(g) If during the execution of the Works the Contractor shall receive any claim arising out of the execution of the Works in respect of damage to highways or bridges, he shall immediately report the facts to the Engineer. The Contractor shall negotiate a settlement in respect of such claims and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto.</p>
<b>4.16 Transport of Goods</b>	<p>Unless otherwise stated in the <b>Particular Conditions</b>:</p> <p>(a) the Contractor shall give the Engineer not less than 21 days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;</p> <p>(b) the Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and</p> <p>(c) the Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.</p>

<p><b>4.17 Contractor's Equipment</b></p>	<p>The Contractor shall be responsible for all Contractor's Equipment. When brought on to the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.</p>
<p><b>4.18 Protection of the Environment</b></p>	<p>The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.</p> <p>The Contractor shall ensure that emissions, surface discharges and effluent from the Contractor's activities shall not exceed the values stated in the Specification or prescribed by applicable Laws.</p> <p>Contractor shall submit Outline Environmental Plan in accordance with the provisions of Employer's Safety, Health &amp; Environment (SHE) Manual and shall include in summary form, the Contractor's proposed means of complying with his obligations in relation to:</p> <ul style="list-style-type: none"> <li>• the Site Environment; and</li> <li>• System Environment as described in Works Requirements.</li> </ul> <p>Within 60 days of the date of the Notice to Proceed, the Contractor shall submit a detailed and comprehensive Environmental Plan based on the Outline Environmental Plan. The Environmental Plan shall include detailed policies, procedures and applicable regulations.</p> <p>The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer and the Employer to monitor and conduct tests at site to verify that the Environmental Plan is being properly and fully implemented.</p>
<p><b>4.19 Electricity, Water and Gas</b></p>	<p>The Contractor shall be responsible for the provision of all power, water and gas and any other services, at his own cost, he may require for his construction activities and to the extent defined in the Specifications, for the tests.</p> <p>However, the Contractor may be permitted at the discretion of Employer to use for the purposes of the Works such supplies of electricity, water, gas and other services, if available, at the prevailing price payable to Employer. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed. Necessary equipment, arrangements, &amp; metering devices shall be arranged by Contractor at his own cost</p>

	<p>The quantities consumed and the amounts due (at these prices) for such services shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Employer.</p>
<p><b>4.20 Employer's Equipment and Free-Issue Materials</b></p>	<p>The Employer will not provide any tools, plant, equipment and machinery or materials under the Contract. The Contractor shall arrange the required tools, plants, equipment at his own cost without any additional cost to Maha-Metro.</p> <p>However, the Employer shall make the Employer's Equipment (if any) available for the use of the Contractor in the execution of the Works in accordance with the details, arrangements and prices stated in the Specification. Unless otherwise stated in the Specification:</p> <ul style="list-style-type: none"> <li>(a) the Employer shall be responsible for the Employer's Equipment, except that</li> <li>(b) the Contractor shall be responsible for each item of Employer's Equipment whilst any of the Contractor's Personnel is operating it, driving it, directing it or in possession or control of it.</li> </ul> <p>The appropriate quantities and the amounts due (at such stated prices) for the use of Employer's Equipment shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Employer.</p> <p>The Employer shall supply, free of charge, the "free-issue materials" (if any) in accordance with the details stated in the Specification. The Employer shall, at his risk and cost, provide these materials at the time and place specified in the Contract. The Contractor shall then visually inspect them, and shall promptly give notice to the Engineer of any shortage, defect or default in these materials. Unless otherwise agreed by both Parties, the Employer shall immediately rectify the notified shortage, defect or default.</p> <p>After this visual inspection, the free-issue materials shall come under the care, custody and control of the Contractor. The Contractor's obligations of inspection, care, custody and control shall not relieve the Employer of liability for any shortage, defect or default not apparent from a visual inspection.</p>
<p><b>4.21 Progress Reports</b></p>	<p>Unless otherwise stated in the <b>Particular Conditions</b>, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in three copies. The first report shall cover the period up to the end of the first calendar month following the Commencement</p>

	<p>Date. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.</p> <p>Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.</p> <p>Each report shall include:</p> <ul style="list-style-type: none"> <li>(a) charts and detailed descriptions of progress, including each stage of design (if any), Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each nominated Sub Contractor (as defined in Clause 5 [Nominated Sub Contractors]),</li> <li>(b) photographs showing the status of manufacture and of progress on the Site;</li> <li>(c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of: <ul style="list-style-type: none"> <li>(i) commencement of manufacture,</li> <li>(ii) Contractor's inspections,</li> <li>(iii) tests, and</li> <li>(iv) shipment and arrival at the Site;</li> </ul> </li> <li>(d) the details described in Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment];</li> <li>(e) copies of quality assurance documents, test results and certificates of Materials;</li> <li>(f) list of notices given under Sub-Clause 2.5 [Employer's Claims] and notices given under Sub-Clause 20.1 [Contractor's Claims];</li> <li>(g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and</li> <li>(h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardise the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.</li> </ul>
<b>4.22 Security of the Site</b>	<p>Unless otherwise stated in the <b>Particular Conditions</b>:</p> <ul style="list-style-type: none"> <li>(a) the Contractor shall be responsible for keeping unauthorised persons off the Site, and</li> </ul>

	<p>(b) authorised persons shall be limited to the Contractor's Personnel and the Employer's Personnel; and to any other personnel notified to the Contractor, by the Employer or the Engineer, as authorised personnel of the Employer's other Contractors on the Site.</p> <p>(c) The Contractor shall ensure proper security of all his assets along with Employer's assets by proper barricading / fencing (where ever required) and by deploying adequate security personnel and Security Equipment at his own cost.</p> <p>(d) The Contractor shall throughout the execution of the Works including the carrying out of any testing, commissioning (including Integrated Testing and Commissioning), or remedying of any defect which includes the following:-</p> <p>(i) take full responsibility for the adequacy, stability, safety and security of the Works, Plant, Contractor's Equipment, Temporary Works, operations on Site and methods of manufacture, installation, construction and transportation;</p> <p>(ii) provide and maintain all lights, guards, fences and warning signs and watchmen when and where necessary or required by the Engineer or by laws or by any relevant authority for the protection of the Works and for the safety and convenience of the public and all persons on or in the vicinity of the Site; and</p> <p>(iii) The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer and the Employer to carry out surveillance, by installing CCTV Cameras with backup system to verify that the Safety &amp; security Plans are being properly and fully implemented.</p>
<b>4.23 Contractor's Operations on Site</b>	<p>The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Engineer as additional working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.</p> <p>During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction, and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.</p> <p>Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor</p>



	shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.
<b>4.24 Fossils</b>	<p>All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.</p> <p>The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion].</p> <p>After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
<b>5. Nominated Sub Contractors</b>	
<b>5.1 Definition of "nominated Sub Contractor"</b>	<p>In the Contract, "nominated Sub Contractor" means a Sub Contractor:</p> <ul style="list-style-type: none"> <li>(a) who is stated in the Contract as being a nominated Sub Contractor, or</li> <li>(b) whom the Engineer, under Clause 13 [Variations and Adjustments], instructs the Contractor to employ as a Sub Contractor subject to Sub-Clause 5.2 [Objection to Notification].</li> <li>(c) If the design is also a part of the contract, Employer may nominate designers as a subcontractor and a list of such nominated designer shall be provide in Section-III: EQC. Contractor may engage any one of them as approved designer</li> </ul>
<b>5.2 Objection to Nomination</b>	<p>The Contractor shall not be under any obligation to employ a nominated Sub Contractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting particulars. An objection shall be deemed reasonable if it arises from (among other things) any of the following matters, unless the Employer agrees in writing to indemnify the Contractor against and from the consequences of the matter:</p>

	<p>(a) there are reasons to believe that the Sub Contractor does not have sufficient competence, resources or financial strength;</p> <p>(b) the nominated Sub Contractor does not accept to indemnify the Contractor against and from any negligence or misuse of Goods by the nominated Sub Contractor, his agents and employees; or</p> <p>(c) the nominated Sub Contractor does not accept to enter into a subcontract which specifies that, for the subcontracted work (including design, if any), the nominated Sub-Contractor shall:</p> <ul style="list-style-type: none"> <li>(i) undertake to the Contractor such obligations and liabilities as will enable the Contractor to discharge his obligations and liabilities under the Contract;</li> <li>(ii) indemnify the Contractor against and from all obligations and liabilities arising under or in connection with the Contract and from the consequences of any failure by the Sub-Contractor to perform these obligations or to fulfil these liabilities, and</li> <li>(iii) be paid only if and when the Contractor has received from the Employer payments for sums due under the Subcontract referred to under Sub-Clause 5.3 [Payment to nominated Sub-Contractors].</li> </ul>
<b>5.3 Payments to nominated Sub Contractors</b>	<p>The Contractor shall pay to the nominated Sub-Contractor the amounts shown on the nominated Sub-Contractor's invoices approved by the Contractor, which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with sub-paragraph (b) of Sub-Clause 13.5 [Provisional Sums], except as stated in Sub-Clause 5.4 [Evidence of Payments].</p> <p><b>Any payments due to Sub Contractor is the responsibility of the Contractor and Employer neither liable to pay any Sub Contractor directly nor shall be party in any dispute arising between Contractor and Sub Contractor.</b></p>
<b>5.4 Evidence of Payments</b>	<p>Before issuing a Payment Certificate which includes an amount payable to a nominated Sub-Contractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Sub-Contractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:</p> <ul style="list-style-type: none"> <li>(a) submits this reasonable evidence to the Engineer, or</li> <li>(b)</li> </ul>

	<p>(i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and</p> <p>(ii) submits to the Engineer reasonable evidence that the nominated Sub Contractor has been notified of the Contractor's entitlement,</p> <p>then the Employer may (at his sole discretion) pay, direct to the nominated Sub Contractor, part or all of such amounts previously certified (less applicable deductions) as are due to the nominated Sub Contractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Employer, the amount which the nominated Sub Contractor was directly paid by the Employer.</p>
<b>6. Staff and Labour</b>	
<b>6.1 Engagement of Staff and Labour</b>	<p>Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labour, local or otherwise, and for their payment, feeding, transport, and, when appropriate, housing.</p> <p>The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour with appropriate qualifications and experience from sources within the Country.</p>
<b>6.2 Rates of Wages and Conditions of Labour</b>	<p>The Contractor shall pay rates of wages, and observe conditions of labour, which are not lower than the rate fixed by legislation of the Country / Local Governing Authority where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by Employers whose trade or industry is similar to that of the Contractor.</p> <p><b>(xxii)</b> The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the Laws of the Country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.</p> <p><b>(a)</b> The Contractor shall make himself aware of all labour regulations and their impact on the cost and build up the same in the Contract Price. During the Contract Period no extra amount in this regard shall be payable to the Contractor, for whatsoever reason including any revision of rates payable to</p>

	<p>the labour due to revision of rates payable in Minimum Wages Act.</p> <p>(b) The Contractor shall pay wages to the workers and staff engaged in this work as per minimum wages act of Government of India, as per the applicable latest amendment</p> <p>(c) The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the Laws of the Country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.</p> <p>(d) The Contractor shall, if required by the Employer, deliver to the Engineer or to his office, a return in detail, in such form and at such intervals as the Employer may prescribe, showing the number of labour employed in different categories by the Contractor on the Site.</p> <p>(e) Labour provided by the Contractor, either directly or through sub-Contractors, for the exclusive use of the Employer or the Engineer, shall, for the purpose of this Sub-Clause, be deemed to be employed by the Contractor.</p> <p>(f) In the event of default being made in the payment of any money in respect of wages of any person employed by the Contractor or any of its sub-Contractors of any tier in and for carrying out of this Contract and if a claim therefore is filed in the office of the Labour Authorities and proof thereof is furnished to the satisfaction of the Labour Authorities, the Employer may, failing payment of the said money by the Contractor, make payment of such claim on behalf of the Contractor to the said Labour Authorities and any sums so paid shall be recoverable by the Employer from the Contractor.</p>
<b>6.3 Persons in the Service of Employer</b>	The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Employer's Personnel.
<b>6.4 Labour Laws</b>	<p>The Contractor shall comply with all the relevant labour Laws of Country where the Work is being executed, applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.</p> <p>The Contractor shall require to comply all applicable Laws enacted by Government of India &amp; Govt. Of Maharashtra applicable &amp; enforceable during the work, including those concerning safety at work.</p>

<p><b>6.5 Working Hours</b></p>	<p>No work shall be carried out on the Site on locally recognised days of rest, or outside the normal working hours stated in the <b>Particular Conditions</b>, unless:</p> <ul style="list-style-type: none"> <li>(a) otherwise stated in the Contract,</li> <li>(b) the Engineer gives consent, or</li> <li>(c) the work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.</li> <li>(d) the Works is to be carried out as per the normal working hours as provided in <b>Particular Condition</b> Of Contract and as per directive of local governing body of Country. However, in exceptional and emergent circumstances the Contractor has to work, under running condition of railway traffic, road traffic, crowded commercial area and during night hours or shifts also with limited working hours. Necessary arrangement as per the relevant labour laws <b>and</b> safety protocol shall be made by Contractor at his own cost without charging anything extra to Employer.</li> </ul>
<p><b>6.6 Facilities for Staff and Labour</b></p>	<p>Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel as per legislative / administrative direction of Country. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Specification / Work Requirement / Particular Condition of Contract of elsewhere in Bid Document.</p> <p>The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.</p>
<p><b>6.7 Health and Safety</b></p>	<p>The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Employer's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.</p> <p>The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor</p>

	<p>shall provide whatever is required by this person to exercise this responsibility and authority.</p> <p>The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.</p> <p>HIV-AIDS Prevention. The Contractor shall conduct an HIV-AIDS awareness programme via an approved service provider, and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.</p> <p>The Contractor shall throughout the contract (including the Defects Notification Period): (i) conduct Information, Education and Communication (IEC) campaigns, at least every other month, addressed to all the Site staff and labour (including all the Contractor's employees, all Sub Contractors and any other Contractor's or Employer's personnel employees, and all truck drivers and crew making deliveries to Site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behaviour with respect to, of Sexually Transmitted Diseases (STD) - or Sexually Transmitted Infections (STI) in general and HIV/AIDS in particular; (ii) provide male or female condoms for all Site staff and labour as appropriate; and (iii) provide for STI and HIV/AIDS screening, diagnosis, counselling and referral to a dedicated national STI and HIV/AIDS programme, (unless otherwise agreed) of all Site staff and labour.</p> <p>The Contractor shall include in the programme to be submitted for the execution of the Works under Sub-Clause 8.3 an alleviation programme for Site staff and labour and their families in respect of Sexually Transmitted Infections (STI) and Sexually Transmitted Diseases (STD) including HIV/AIDS. The STI, STD and HIV/AIDS alleviation programme shall indicate when, how and at what cost the Contractor plans to satisfy the requirements of this Sub-Clause and the related specification. For each component, the programme shall detail the resources to be provided or utilised and any related sub-contracting proposed. The programme shall also include provision of a detailed cost estimate with supporting documentation. Payment to the Contractor for preparation and implementation this programme shall not exceed the Provisional Sum dedicated for this purpose.</p>
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	All kind of preventive measures & awareness program regarding checking & treatment of the epidemic / pandemic shall be ensured by Contractor at his cost,
<b>6.8 Contractor's Superintendence</b>	<p>Throughout the execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.</p> <p>Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [Law and Language]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.</p>
<b>6.9 Contractor's Personnel</b>	<p>The Contractor's Personnel shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:</p> <ul style="list-style-type: none"> <li>(a) persists in any misconduct or lack of care,</li> <li>(b) carries out duties incompetently or negligently,</li> <li>(c) fails to conform with any provisions of the Contract, or</li> <li>(d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment.</li> </ul> <p>If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.</p>
<b>6.10 Records of Contractor's Personnel and Equipment</b>	The Contractor shall submit, to the Engineer, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.
<b>6.11 Disorderly Conduct</b>	The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.
<b>6.12 Foreign Personnel</b>	The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel

	<p>are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use his best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel..</p> <p>The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.</p>
<b>6.13 Supply of Foodstuffs</b>	The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.
<b>6.14 Supply of Water</b>	The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.
<b>6.15 Measures against Insect and Pest Nuisance</b>	The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.
<b>6.16 Alcoholic Liquor or Drugs</b>	The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereof by Contractor's Personnel.
<b>6.17 Arms and Ammunition</b>	The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.
<b>6.18 Festivals and Religious Customs</b>	The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs.
<b>6.19 Funeral Arrangements</b>	The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of his local employees who may die while engaged upon the Works.



<b>6.20 Prohibition of Forced or Compulsory Labour</b>	The Contractor shall not employ forced labour, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements.
<b>6.21 Prohibition of Harmful Child Labour</b>	The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where the relevant labour laws of the Country have provisions for employment of minors, the Contractor shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.
<b>6.22 Employment Records of Workers</b>	The Contractor shall keep complete and accurate records of the employment of labour at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment].
<b>6.23 Workers' Organisations</b>	In countries where the relevant labour laws recognise workers' rights to form and to join workers' organisations of their choosing without interference and to bargain collectively, the Contractor shall comply with such laws. Where the relevant labour laws substantially restrict workers' organisations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. In either case described above, and where the relevant labour laws are silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organisations of their choosing or from bargaining collectively, and shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organisations and bargain collectively. The Contractor shall engage with such workers' representatives. Workers' organisations are expected to fairly represent the workers in the workforce.

<p><b>6.24 Non-Discrimination and Equal Opportunity</b></p>	<p>The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. In countries where the relevant labour laws provide for non-discrimination in employment, the Contractor shall comply with such laws. When the relevant labour laws are silent on non-discrimination in employment, the Contractor shall meet this Sub-Clause's requirements. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination.</p>
<p><b>7. Plant, Materials and Workmanship</b></p>	
<p><b>7.1 Manner of Execution</b></p>	<p>The Contractor shall execute Work, carry out the manufacture of Plants and equipment, the production and manufacture of Materials, and all other execution of the Works:</p> <ul style="list-style-type: none"> <li>(a) in the manner (if any) specified in the Contract,</li> <li>(b) in a proper workman like and careful manner, in accordance with recognised good practice, and</li> <li>(c) with properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.</li> <li>(d) The Contractor shall execute the work as per design, drawings and specifications provided for the Works in accordance with the site plans and Work's Requirements. Any design detail, plan, drawing, specifications, notes, annotations, and information required shall be provided in such sufficient format, details, extent, size and scale and within such time as may be required to ensure effective execution of Works and/or as otherwise required by the Engineer.</li> <li>(e) The Contractor shall be fully responsible for the Plants, Materials, goods, workmanship, preparing, developing and coordinating all execution Works to enable that part of the Works to be constructed and/or to be fully operational in accordance with the Contract's requirements.</li> </ul>

<p><b>7.2 Samples</b></p>	<p>The Contractor shall submit the samples of Materials, and relevant information, to the Engineer for consent prior to using the Materials in or for the Works:</p> <ul style="list-style-type: none"> <li>(a) manufacturer's standard samples of Materials, components, equipment and samples specified in the Contract / Work Requirements / Scope of Work / Bill of quantities, all at the Contractor's cost, and</li> <li>(b) additional samples instructed by the Engineer as a Variation.</li> </ul> <p>Each sample shall be labelled as to origin and intended use in the Works.</p>
<p><b>7.3 Inspection</b></p>	<p>The Employer's Personnel shall at all reasonable times:</p> <ul style="list-style-type: none"> <li>(a) have full access to all parts of the Site and to all places from which natural Materials are being obtained, and</li> <li>(b) during production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.</li> </ul> <p>The Contractor shall give the Employer's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.</p> <p>The Contractor shall give notice to the Engineer whenever any work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Engineer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.</p>
<p><b>7.4 Testing</b></p>	<p>This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).</p> <p>Except as otherwise specified in the Contract, the Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer, the time and place for the specified testing of any Plant, Materials and other parts of the Works.</p>

	<p>The Engineer may, under Clause 13 [Variations and Adjustments], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.</p> <p>The Engineer shall give the Contractor not less than <b>24 hours' notice of the Engineer's</b> intention to attend the tests. If the Engineer does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Engineer, and the tests shall then be deemed to have been made in the Engineer's presence.</p> <p>If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Employer is responsible, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an <b>extension of time only</b> for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion].</p> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p> <p>The Contractor shall promptly forward to the Engineer duly certified reports of the tests. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Engineer has not attended the tests, he shall be deemed to have accepted the readings as accurate.</p> <p>All test shall be carried out at approved laboratories as specified in <b>Particular Condition Of Contract</b>.</p>
<b>7.5 Rejection</b>	<p>If, as a result of an examination, inspection, measurement or testing, any Plant, Materials or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the Plant, Materials or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.</p> <p>If the Engineer requires this Plant, Materials or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Employer to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer.</p>

<p><b>7.6 Remedial Work</b></p>	<p>Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:</p> <ul style="list-style-type: none"> <li>(a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,</li> <li>(b) remove and re-execute any other work which is not in accordance with the Contract, and</li> <li>(c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.</li> </ul> <p>The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c).</p> <p>If the Contractor fails to comply with the instruction, the Employer shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay to the Employer all costs arising from this failure.</p> <p><b>The Contractor shall not be released from any liability or obligation under the Contract by reason of any such inspection or testing or witnessing of testing, or by the submission of reports of inspection or testing to the Engineer.</b></p>
<p><b>7.7 Ownership of Plant and Materials</b></p>	<p>Except as otherwise provided in the Contract, each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Employer at whichever is the earlier of the following times, free from liens and other encumbrances:</p> <ul style="list-style-type: none"> <li>(a) when it is incorporated in the Works;</li> <li>(b) when the Contractor is paid the corresponding value of the Plant and Materials under Sub-Clause 8.10 [Payment for Plant and Materials in Event of Suspension].</li> <li>(c) <b>The plant, goods and material not finally taken over as per GC Clause 10 but payment against which have been made in part or full against Indemnity Bond / Safety Custody/ Bank Guarantee will remain under the Contractor's custody. The Contractor shall be responsible for its safety and will bear all the risks till taken over by the Employer.</b></li> </ul>
<p><b>7.8 Royalties</b></p>	<p>Unless otherwise stated in the Specification, the Contractor shall pay all royalties, rents and other payments for:</p> <ul style="list-style-type: none"> <li>(a) natural Materials obtained from outside the Site, and</li> </ul>

	<p>(b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.</p> <p>(c) <b>The Contractor has to pay all royalties to the State (GoM) / Central (GoI) government towards the consumption of natural materials used in the proposed work. The proof of the same shall be submitted to the Employer whenever desired so.</b></p>
<b>7.9 Workmanship and Quality Control</b>	<p>Within 28 days of the issue of the Notice to Proceed, the Contractor shall submit to the Engineer, for his consent, his proposed Site Quality Plan based on the Outline Quality Plan and the Employer's Requirements. The quality manual should address the quality system as required by ISO 9001 or equivalent standard. Any supplement to the Site Quality Plan shall be submitted at least 14 days before commencement of the relevant work.</p> <p>Upon the Engineer notifying his consent to the Site Quality Plan, or any supplement thereto, the Contractor shall, adhere to the principles and procedures contained in such document, except where the Engineer gives his consent to any amended or varied version thereof. The Contractor shall cause any sub-Contractors to adhere to this Plan.</p> <p>The Contractor shall appoint a suitably qualified and experienced person, not otherwise engaged in the performance of the Contract, to act as manager of the quality assurance system and shall provide such other personnel and resources as required to ensure effective operation of the quality assurance system. The said manager shall carry out audits of the application of the quality assurance system, and ensure effective quality control and delivery of quality assurance.</p> <p>The Contractor shall provide all necessary access, assistance and facilities to enable the Engineer to carry out surveillance visits both on and off the Site to verify that the quality assurance system is being properly and fully implemented. No extra payment shall be made in this regard and the cost of the Work under this element shall be deemed to be included in the Contract Price.</p>
<b>8. Commencement, Delays and Suspension</b>	
<b>8.1 Commencement of Works</b>	<p>Except as otherwise provided in the Particular Conditions of Contract, the Commencement Date shall be the date indicated in the Letter of Acceptance issued after obtaining NOC from funding agency (If required as per guidelines of funding agency)</p> <p><b>The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date,</b></p>

	<b>and shall then proceed with the Works with due expedition and without delay.</b>
<b>8.2 Time for Completion</b>	<p>The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:</p> <ul style="list-style-type: none"> <li>(a) achieving the passing of the Tests on Completion, and</li> <li>(b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections].</li> </ul>
<b>8.3 Programme</b>	<p>The Contractor shall prepare and submit his detailed Programme of Work within 28 days from the date of issue of LOA under Sub Clause 8.1, so as to achieve key dates (as agreed by both parties) of various activities. The Contractor shall complete the work in a phased manner fixing priorities to the different stages of the work as per the requirement of project from time to time.</p> <p>Consent by the Engineer to a Works Programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract, nor in the event that a Works Programme indicates that a Key Date has not or will not be met, constitute any form of acknowledgement that the Contractor is or may be entitled to an extension of time in relation to such Key Date or a Mile Stone.</p> <p>If, at any time, the Engineer gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised programme to the Engineer in accordance with this Sub Clause with a request of approval Engineer on valid reasons.</p> <p><b>Manufacture, Installation and Construction Methods</b></p> <p>The Contractor shall submit complete documents and information pertaining to the methods of manufacture, installation and construction which the Contractor proposes to adopt or use, (and if applicable such calculations of stresses, strains and deflections and the like that will or may arise in the Works or to the other works comprising the Project or any parts thereof during installation from the use of such methods). The Engineer will then check to see whether, if such methods are adhered to, the Works can be executed in accordance with the Contract and without detriment to the Works (when completed) and to</p>

	<p>other works comprising the Project and in a manner, which minimises disruption to road and pedestrian traffic.</p> <p>The Engineer shall inform the Contractor in writing within 21 days after receipt of the above information;</p> <p>(a) that the Contractor's proposed methods of manufacture, installation and construction have the consent of the Engineer; or</p> <p>(b) in what respects, in the opinion of the Engineer the Contractor's proposed methods of manufacture, installation and construction:</p> <ol style="list-style-type: none"> <li>a. fail to comply with the Employer's Requirements and/or the Definitive Design and/or the Final Design;</li> <li>b. would be detrimental to the Works and/or to the other works comprising the Project;</li> <li>c. do not comply with the other requirements of the Contract;</li> </ol> <p>or</p> <p>(c) as to the further documents or information which are required to enable the Engineer to properly assess the proposed methods of manufacture, installation and construction.</p> <p>In the event that the Engineer does not give his consent, the Contractor shall take such steps or make such changes in the said methods or supply such further documents or information as may be necessary to meet the Engineer's requirements and to obtain his consent. The Contractor shall not change the methods of manufacture, installation and construction which have received the Engineer's consent without further review and consent in writing of the Engineer.</p> <p>Notwithstanding the foregoing provisions of this Clause, or that certain of the Contractor's proposed methods of manufacture, installation and construction may be the subject of the consent of the Engineer, the Contractor shall not be relieved of any liability or obligation under the Contract.</p>
<b>8.4 Extension of Time for Completion</b>	<p>The Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause 10.1 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:</p> <p>(a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [Variation Procedure]) or other substantial change in the quantity of an item of work included in the Contract,</p>



	<p>(b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions,</p> <p>(c) exceptionally &amp; unprecedented adverse climatic conditions,</p> <p>(d) Unforeseeable shortages in the availability of personnel or Goods caused by epidemic, pandemic or governmental actions / executive order of local Governing Body, or</p> <p>(e) any delay, impediment or prevention caused by or attributable to the Employer, the Employer's Personnel, or the Employer's other Contractors.</p> <p>If the Contractor considers himself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer in accordance with Sub-Clause 20.1 [Contractor's Claims]. When determining each extension of time under Sub-Clause 20.1, the Engineer shall review previous determinations and may increase, but shall not decrease, the total extension of time.</p>
<b>8.5 Delays Caused by Authorities</b>	<p>If the following conditions apply, namely:</p> <p>(a) the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,</p> <p>(b) these authorities delay or disrupt the Contractor's work, and</p> <p>(c) the delay or disruption was Unforeseeable,</p> <p>then this delay or disruption will be considered as a cause of delay under sub-paragraph (b) of Sub-Clause 8.4 [Extension of Time for Completion].</p>
<b>8.6 Rate of Progress</b>	<p>If, at any time:</p> <p>(a) actual progress is too slow to complete within the Time for Completion, and/or</p> <p>(b) progress has fallen (or will fall) behind the current programme under Sub-Clause 8.3 [Programme],</p> <p>other than as a result of a cause listed in Sub-Clause 8.4 [Extension of Time for Completion], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [Programme], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Extended Time for Completion, on valid reason of delay.</p> <p>Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods,</p>

	<p>at the risk and cost of the Contractor. If these revised methods cause the Employer to incur additional costs, the Contractor shall subject to notice under Sub-Clause 2.5 [Employer's Claims] pay these costs to the Employer, in addition to delay damages (if any) under Sub-Clause 8.7 below.</p> <p>If the Revised Work Programme submitted by Contractor &amp; agreed by Employer, but at any stage of work, Employer is willing to get the work completed in a compressed time period or change work methodology, then in such case additional costs of revised methods including acceleration measures in compressed time period, instructed by the Engineer to reduce delays resulting from causes listed under Sub-Clause 8.4 [Extension of Time for Completion] shall be paid by the Employer as Determined by Engineer, without generating, however, any other additional payment benefit to the Contractor.</p>
<b>8.7 Delay Damages</b>	<p>If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Contractor shall subject to notice under Sub-Clause 2.5 [Employer's Claims] pay delay damages to the Employer for this default. These delay damages shall be the sum stated in the <b>Particular Conditions</b>, which shall be paid for every day which shall elapse between the relevant Time for Completion and the date stated in the Taking-Over Certificate. However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the <b>Particular Conditions</b>.</p> <p>These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 15.2 [Termination by Employer] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.</p>
<b>8.8 Suspension of Work</b>	<p>The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.</p> <p>The Engineer may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses 8.9, 8.10 and 8.11 shall not apply.</p>
<b>8.9 Consequences of Suspension</b>	<p>If the Contractor suffers delay and/or incurs Cost from complying with the Engineer's instructions under Sub-Clause 8.8 [Suspension of Work] and/or from resuming the work, the Contractor shall give notice</p>

	<p>to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p> <p>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</p> <p>(b) payment of any such Cost, which shall be included in the Contract Price.</p> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p> <p>The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [Suspension of Work].</p> <p>However The Contractor shall not be entitled to extra cost (if any), incurred by him, during the period of suspension of Work, if such suspension is</p> <ol style="list-style-type: none"> <li>1. provided for in the Contract, or</li> <li>11. necessary for proper execution of Woks or by reasons of weather condition or by some default on the part of the Contractor, or</li> <li>111. necessary for the safety of Works or any part thereof or</li> <li>1v. necessary for the safety of adjoining public or other property or safety of the public or workmen or those who have to be at the site or</li> <li>v. to ensure safety and to avoid disruption of traffic and utilities, as also to permit fast repairs and restoration of any damaged utilities, or</li> <li>v1. on account of work carried out by the Contractor not in accordance with the directions of the Engineer; or</li> <li>v11. on account of any legislative or executive order of Government</li> <li>v111. If the requirement of work ceases.</li> <li>1x. on account of any other reason which is not attributable to the Employer.</li> </ol>
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<b>8.10 Payment for Plant and Materials in Event of Suspension</b>	<p>The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/or Materials which have not been delivered to Site, if:</p> <ul style="list-style-type: none"> <li>(a) the work on Plant or delivery of Plant and/or Materials has been suspended for more than 28 days, and</li> <li>(b) the Contractor has marked the Plant and/or Materials as the Employer's property in accordance with the Engineer's instructions.</li> </ul>
<b>8.11 Prolonged Suspension</b>	<p>If the suspension under Sub-Clause 8.8 [Suspension of Work] has continued for more than 84 days, the Contractor may request the Engineer's permission to proceed. If the Engineer does not give permission within 28 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [Variations and Adjustments] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [Termination by Contractor].</p>
<b>8.12 Resumption of Work</b>	<p>After the permission or instruction to proceed is given, the Contractor and the Engineer shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension after receiving from the Engineer an instruction to this effect.</p>
<b>9. Tests on Completion</b>	
<b>9.1 Contractor's Obligations</b>	<p>The Contractor shall carry out the Tests on Completion in accordance with this Clause and Sub-Clause 7.4 [Testing], after providing the documents in accordance with sub-paragraph (d) of Sub-Clause 4.1 [Contractor's General Obligations].</p> <p>The Contractor shall give to the Engineer not less than 21 days' notice of the date after which the Contractor will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.</p> <p>In considering the results of the Tests on Completion, the Engineer shall make allowances for the effect of any use of the Works by the Employer on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed any Tests on Completion, the Contractor shall submit a certified report of the results of these Tests to the Engineer.</p>

<p><b>9.2 Delayed Tests</b></p>	<p>If the Tests on Completion are being unduly delayed by the Employer, Sub-Clause 7.4 [Testing] (fifth paragraph) and/or Sub-Clause 10.3 [Interference with Tests on Completion] shall be applicable.</p> <p>If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contractor may fix and of which he shall give notice to the Engineer.</p> <p>If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Employer's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contractor and the results of the Tests shall be accepted as accurate.</p>
<p><b>9.3 Retesting</b></p>	<p>If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [Rejection] shall apply, and the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.</p>
<p><b>9.4 Failure to Pass Tests on Completion</b></p>	<p>If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [Retesting], the Engineer shall be entitled to:</p> <ul style="list-style-type: none"> <li>(a) order further repetition of Tests on Completion under Sub-Clause 9.3;</li> <li>(b) if the failure deprives the Employer of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Employer shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or</li> <li>(c) Issue a Taking-Over Certificate, if the Employer so requests subjected to following.</li> </ul> <p>In the event of sub-paragraph (c), the Contractor shall proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Employer as a result of this failure.</p> <p>Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Employer may require the reduction to be (i) agreed by both Parties (in full satisfaction of this failure only) and paid before this Taking-Over Certificate is issued if the work is technically safe &amp; able meet the desired purpose, for which it was constructed / manufactured, or (ii) determined and paid under</p>

	Sub-Clause 2.5 [Employer's Claims] and Sub-Clause 3.5 [Determinations].
<b>9.5 Integrated Testing and Commissioning</b>	<p><b>Integrated Testing</b></p> <p>Tests on Completion shall also include Integrated Testing where applicable as per the contract conditions. The Contractor shall, following satisfactory completion of tests on his works, equipment, sub-systems or system, perform, at the direction of the Engineer, programme of tests to verify and confirm the compatibility and complete performance of his works, equipment, sub-systems or system with the works, equipment, sub-systems or system provided by others.</p> <p><b>Compilation of Test Results</b></p> <p>The results of the Integrated Testing and Commissioning shall be compiled and evaluated by the Engineer and the Contractor.</p> <p><b>Re-testing</b></p> <p>If the Works, or a part thereof, or a Section, fail to pass the Integrated Testing and Commissioning, the Engineer shall require such failed Tests, to be repeated under the same terms and conditions. If such failure and retesting result from a default of the Contractor and cause the Employer to incur additional costs, the same shall be recoverable from the Contractor by the Employer, and may be deducted by the Employer from any monies due, or to become due, to the Contractor.</p> <p><b>Failure to pass Test</b></p> <p>If the Works, or a part thereof, or a Section, fail to pass Integrated Testing and Commissioning and the Contractor in consequence proposes to make any adjustment or modification to the Works or a part thereof, or a section, the Engineer may, with the approval of the Employer, instruct the Contractor to carry out such adjustment or modification, at his own cost and to satisfy the requirements of Integrated Testing and Commissioning within such time as the Employer/ Engineer may deem to be reasonable.</p> <p><b>Statutory Requirements</b></p> <p>The Contractor along with others shall carry out all statutory tests and trials, under the supervision of the Engineer, necessary for obtaining sanction of the competent authority for opening the system for public carriage of passengers.</p> <p>The Contractor shall, if required by the Employer, deliver to the Engineer or to his office, a return in detail, in such form and at such intervals as the Employer may prescribe, showing the number of labour employed in different categories by the Contractor on the Site.</p>

## 10. Employer's Taking Over

<p><b>10.1 Taking Over of the Works and Sections</b></p>	<p>Except as stated in Sub-Clause 9.4 [Failure to Pass Tests on Completion], the Works shall be taken over by the Employer when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2 [Time for Completion] and except as allowed in sub-paragraph (a) below, and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.</p> <p>The Contractor may apply by notice to the Engineer for a Taking-Over Certificate not earlier than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contractor may similarly apply for a Taking-Over Certificate for each Section.</p> <p>The Engineer shall, within 28 days after receiving the Contractor's application:</p> <ul style="list-style-type: none"> <li>(a) issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or</li> <li>(b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause.</li> </ul> <p>If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 28 days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.</p>
<p><b>10.2 Taking Over of Parts of the Works</b></p>	<p>The Engineer may, at the sole discretion of the Employer, issue a Taking-Over Certificate for any part of the Permanent Works.</p> <p>The Employer shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer has issued a Taking-Over Certificate for this part. However, if the Employer does use any part of the Works before the Taking-Over Certificate is issued:</p> <ul style="list-style-type: none"> <li>(a) the part which is used shall be deemed to have been taken over as from the date on which it is used,</li> </ul>

	<p>(b) the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Employer, and</p> <p>(c) if requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part.</p> <p>After the Engineer has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests on Completion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.</p> <p>If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages thereafter for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these proportions. The provisions of this paragraph shall only apply to the daily rate of delay damages under Sub-Clause 8.7 [Delay Damages], and shall not affect the maximum amount of these damages.</p>
<p><b>10.3 Interference with Tests on Completion</b></p>	<p>If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Employer is responsible, the Employer shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.</p> <p>The Engineer shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.</p> <p>If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p>



	<p>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</p> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
<b>10.4 Surfaces Requiring Reinstatement</b>	<p>Except as otherwise stated in a Taking-Over Certificate, a certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.</p>
<b>11. Defects Liability</b>	
<b>11.1 Completion of Outstanding Work and Remedying Defects</b>	<p>In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:</p> <ul style="list-style-type: none"> <li>(a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and</li> <li>(b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).</li> <li>(c) If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Employer.</li> <li>(d) During the Defects Liability Period the Contractor shall provide, free of cost, rectification/ reconstruction of faulty work. Deploy competent and skilled personnel and maintain adequate stock of spares/ machine/materials so as to promptly fulfil his obligations during the Defects Liability Period as laid down in Particular Conditions and Works Requirements.</li> <li>(e) <u>Maintenance during Defects Liability Period</u></li> </ul> <p>Contractor shall establish an office for the purpose with communication facility so as to facilitate communication for reporting failures and liaison with maintenance staff manning the structure round the clock. The supervisor in-charge should be provided with mobile communication facility to ensure his presence at the site immediately after reporting. Contractor shall ensure restoration/ rectification/ replacement, within reasonable time, to the satisfaction of Engineer.</p>

	<p>The Engineer in case of the delay as deems fit shall be empowered to carry out the maintenance at the risk and cost of the Contractor.</p> <p>(f) Routine Maintenance</p> <p>Submit Monthly status report to the Engineer -in - Charge.</p> <p>(g) Repairs</p> <p>All equipment that requires repairing shall be immediately serviced and repaired.</p> <p>(h) Complaints</p> <p>The Contractor shall receive calls for any and all problems / defect experienced in the operation of the structure, attend to these without delay. A punch list of above defect shall be maintained by Contractor.</p> <p>(i) Maintenance Log Book</p> <p>The Contractor shall maintain a Maintenance Log Book at completed site, the format for which shall be approved by Engineer. In the Maintenance Log book the details about date of Routine Maintenance, Routine Maintenance activities performed, Details of Call - out visit/ complaints and its action taken report shall be maintained</p> <p>(j) A penalty at the rate specified in Particular Conditions, during the OLP period will be imposed, if Defect/ complaint is not attended within 24 hrs from the time and date of issue of notice of defect.</p>
<b>11.2 Cost of Remedying Defects</b>	<p>All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:</p> <p>(a) any design for which the Contractor is responsible,</p> <p>(b) Plant, Materials or workmanship not being in accordance with the Contract, or</p> <p>(c) failure by the Contractor to comply with any other obligation.</p> <p>(d) Improper operation or maintenance during Defect Liability Period, which was attributable to matters for which the Contractor is responsible</p> <p>If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Employer, and Sub-Clause 13.3 [Variation Procedure] shall apply.</p>
<b>11.3 Extension of Defects</b>	<p>The Employer shall be entitled subject to Sub-Clause 2.5 [Employer's Claims] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot</p>

<p><b>Notification Period</b></p>	<p>be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.</p> <p>If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [Suspension of Work] or Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.</p>
<p><b>11.4 Failure to Remedy Defects</b></p>	<p>If the Contractor fails to remedy any defect or damage within a reasonable time, a date shall be fixed by Engineer (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date, by the Engineer.</p> <p>If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Employer may (at his sole discretion/option):</p> <ul style="list-style-type: none"> <li>(a) carry out the work himself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [Employer's Claims] pay to the Employer the costs reasonably incurred by the Employer in remedying the defect or damage;</li> <li>(b) require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.5 [Determinations]; or</li> <li>(c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Employer shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.</li> </ul>
<p><b>11.5 Removal of Defective Work</b></p>	<p>If the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the</p>

	amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.
<b>11.6 Further Tests</b>	<p>If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 days after the defect or damage is remedied.</p> <p>These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [Cost of Remedying Defects], for the cost of the remedial work.</p>
<b>11.7 Right of Access</b>	Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Clause, except as may be inconsistent with the Employer's reasonable security restrictions.
<b>11.8 Contractor to Search</b>	The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [Determinations] and shall be included in the Contract Price.
<b>11.9 Performance Certificate</b>	<p>Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.</p> <p>The Engineer shall issue the Performance Certificate within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Employer.</p> <p>Only the Performance Certificate shall be deemed to constitute acceptance of the Works.</p>
<b>11.10 Unfulfilled Obligations</b>	After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

<p><b>11.11 Clearance of Site</b></p>	<p>Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.</p> <p>If all these items have not been removed within 28 days after receipt by the Contractor of the Performance Certificate, the Employer may sell or otherwise dispose of any remaining items. The Employer shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.</p> <p>Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Employer's costs, the Contractor shall pay the outstanding balance to the Employer.</p>
<p style="text-align: center;"><b>12. Measurement and Evaluation</b></p>	
<p><b>12.1 Works to be Measured</b></p>	<p>The Works shall be measured, and valued for payment, in accordance with this Clause. The Contractor shall show in each application under Sub-Clauses 14.3 [Application for Interim Payment Certificates], 14.10 [Statement on Completion] and 14.11 [Application for Final Payment Certificate] the quantities and other particulars detailing the amounts which he considers to be entitled under the Contract.</p> <p>Whenever the Engineer requires any part of the Works to be measured, reasonable notice shall be given to the Contractor's Representative, who shall:</p> <ul style="list-style-type: none"> <li>(a) promptly either attend or send another qualified representative to assist the Engineer in making the measurement, and</li> <li>(b) supply any particulars requested by the Engineer.</li> </ul> <p>If the Contractor fails to attend or send a representative, the measurement made by (or on behalf of) the Engineer shall be accepted as accurate.</p> <p>Except as otherwise stated in the Contract, wherever any Permanent Works are to be measured from records, these shall be prepared by the Engineer. The Contractor shall, as and when requested, attend to examine and agree the records with the Engineer, and shall sign the same when agreed. If the Contractor does not attend, the records shall be accepted as accurate.</p> <p>If the Contractor examines and disagrees the records, and/or does not sign them as agreed, then the Contractor shall give notice to the Engineer of the respects in which the records are asserted to be inaccurate. After receiving this notice, the Engineer shall review the records and either confirm or vary them and certify the payment of the undisputed part. If the Contractor does not so give notice to the</p>

	Engineer within 14 days after being requested to examine the records, they shall be accepted as accurate.
<b>12.2 Method of Measurement</b>	<p>Except as otherwise stated in the Contract and notwithstanding local practice:</p> <p>(a) measurement shall be made of the net actual quantity of each item of the Permanent Works, and</p> <p>(b) the method of measurement shall be in accordance with the Bill of Quantities or other applicable Schedules.</p>
<b>12.3 Evaluation</b>	<p>Except as otherwise stated in the Contract, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the Contract Price by evaluating each item of work, applying the measurement agreed or determined in accordance with the above Sub-Clauses 12.1 and 12.2 and the appropriate rate or price for the item.</p> <p>For each item of work, the appropriate rate or price for the item shall be the rate or price specified for such item in the Contract or, if there is no such item, specified for similar work.</p> <p>Any item of work included in the Bill of Quantities / Scope of work / Employer's Requirement, for which no rate or price was specified shall be considered as included in other rates and prices in the Bill of Quantities / Finance Bid and will not be paid for separately.</p>
<b>12.4 Omissions</b>	<p>Whenever the omission of any work forms part (or all) of a Variation, the value of which has not been agreed, if:</p> <p>(a) the Contractor will incur (or has incurred) cost which, if the work had not been omitted, would have been deemed to be covered by a sum forming part of the Accepted Contract Amount;</p> <p>(b) the omission of the work will result (or has resulted) in this sum not forming part of the Contract Price; and</p> <p>(c) this cost is not deemed to be included in the evaluation of any substituted work;</p> <p>then the Contractor shall give notice to the Engineer accordingly, with supporting particulars. Upon receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this cost, which shall be included in the Contract Price.</p>
<b>13. Variations and Adjustments</b>	
<b>13.1 Right to Vary</b>	Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

	<p>The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, or (ii) such Variation triggers a substantial change in the sequence or progress of the Works. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.</p> <p>Each Variation may include:</p> <ul style="list-style-type: none"> <li>(a) changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),</li> <li>(a) changes to the quality and other characteristics of any item of work,</li> <li>(b) changes to the levels, positions and/or dimensions of any part of the Works,</li> <li>(d) omission of any work unless it is to be carried out by others,</li> <li>(e) any additional work, Plant, Materials or services associated or part of the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or</li> <li>(f) changes to the sequence or timing of the execution of the Works.</li> </ul> <p>The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.</p> <p><b>Any additional work, plant, material or services related to enabling work or site convenience &amp; not a part of Permanent Works shall not be considered as a Variation to assigned work.</b></p>
<b>13.2 Value Engineering</b>	<p>The Contractor may, at any time, submit to the Engineer a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Employer of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Employer of the completed Works, or (iv) otherwise be of benefit to the Employer.</p> <p>The proposal shall be prepared at the cost of the Contractor and shall include the items listed in Sub-Clause 13.3 [Variation Procedure].</p> <p>If a proposal, which is approved by the Engineer, includes a change in the design of part of the Permanent Works, then unless otherwise agreed by both Parties:</p> <ul style="list-style-type: none"> <li>(a) the Contractor shall design this part,</li> </ul>

	<p>(b) sub-paragraphs (a) to (d) of Sub-Clause 4.1 [Contractor's General Obligations] shall apply, and</p> <p>(c) if this change results in a reduction in the contract value of this part, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine a fee, which shall be included in the Contract Price. This fee shall be half (50%) of the difference between the following amounts:</p> <p>(i) such reduction in contract value, resulting from the change, excluding adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost], and</p> <p>(ii) the reduction (if any) in the value to the Employer of the varied works, taking account of any reductions in quality, anticipated life or operational efficiencies.</p> <p>However, if amount (i) is less than amount (ii), there shall not be a fee.</p>
<b>13.3 Variation Procedure</b>	<p>If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:</p> <p>(a) a description of the proposed work to be performed and a programme for its execution,</p> <p>(b) the Contractor's proposal for any necessary modifications to the programme according to Sub-Clause 8.3 [Programme] and to the Time for Completion, and</p> <p>(c) the Contractor's proposal for evaluation of the Variation.</p> <p>(d) The Engineer shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [Value Engineering] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response.</p> <p>(e) Consent of the Engineer &amp; approval of Employer is required on any proposed Variation issued for substantial technical modifications, additional cost or extension of time. Such Variation shall be consolidated in a signed Amendment to Contract agreed by both Parties.</p> <p>(f) Each instruction to execute a Variation, with any requirements for the recording of Costs, shall be issued by the Engineer to the Contractor, who shall acknowledge receipt.</p>



	Each Variation shall be processed in accordance with detailed procedures described in <b>Particular Conditions</b> , unless the Engineer instructs or approves otherwise in accordance with this Clause.
<b>13.4 Payment in Applicable Currencies</b>	If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.
<b>13.5 Provisional Sums</b>	<p>Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer shall have instructed. For each Provisional Sum, the Engineer may instruct:</p> <ul style="list-style-type: none"> <li>(a) Work to be executed (including Plant, Materials or services to be supplied) by the Contractor and valued under Sub-Clause 13.3 [Variation Procedure]; and/or</li> <li>(b) Plant, Materials or services to be purchased by the Contractor, from a nominated Sub Contractor (as defined in Clause 5 [Nominated Sub Contractors] or otherwise; and for which there shall be included in the Contract Price: <ul style="list-style-type: none"> <li>(i) the actual amounts paid (or due to be paid) by the Contractor, and</li> <li>(ii) a sum for overhead charges and profit, calculated as a percentage of these actual amounts as stated in the <b>Particular Conditions</b> under Sub-Clause 13.3 [Variation Procedure]</li> </ul> </li> </ul> <p>The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.</p>
<b>13.6 Daywork</b>	<p>For work of a minor or incidental nature, the Engineer may instruct that a Variation shall be executed on a day work basis. The work shall then be valued in accordance with the Day work Schedule included in the Contract, and the following procedure shall apply. If a Daywork Schedule is not included in the Contract, this Sub-Clause shall not apply.</p> <p>Before ordering Goods for the work, the Contractor shall submit quotations to the Engineer. When applying for payment, the</p>

	<p>Contractor shall submit invoices, vouchers and accounts or receipts for any Goods.</p> <p>Except for any items for which the Daywork Schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer accurate statements in duplicate which shall include the following details of the resources used in executing the previous day's work:</p> <ul style="list-style-type: none"> <li>(a) the names, occupations and time of Contractor's Personnel,</li> <li>(b) the identification, type and time of Contractor's Equipment and Temporary Works, and</li> <li>(c) the quantities and types of Plant and Materials used.</li> </ul> <p>Or</p> <p>Under the provision of unforeseen Schedule provided in Financial Bid / BOQ of Contract.</p> <p>One copy of each statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer, prior to their inclusion in the next Statement under Sub-Clause 14.3 [Application for Interim Payment Certificates].</p>
<p><b>13.7 Adjustments for Changes in Legislation</b></p>	<p>The Contract Price shall be adjusted to take account of any increase or decrease in Cost resulting from a change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Base Date, which affect the Contractor in the performance of obligations under the Contract.</p> <p>If the Contractor suffers (or will suffer) delay and/or incurs (or will incur) additional Cost or saving in cost as a result of these changes in the Laws or in such interpretations, made after the Base Date, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> <li>(a) an extension of time for any such delay, if completion is or likely to be delayed due to Change in Legislation , under Sub-Clause 8.4 [Extension of Time for Completion], and</li> <li>(b) The Contract Price shall be adjusted to take into account any new taxes or any statutory variations, on finished product/item during the contractual completion period shall be to the Employer's account for which the Contractor shall furnish documentary evidence in support of their claims. However, any increase in the cost due to new taxes or change in the existing taxes introduced during the extended contractual completion</li> </ul>

	<p>period due to the Contractor's fault shall be to the Contractor's account.</p> <p>(i) Taxes prior to Base date i.e 28 days prior to latest date of submission of Bid is deemed to be inclusive of price quoted by Bidder.</p> <p>(ii) Any change in legislation of any kind of Taxes by Gol or GOM, after Base Date shall be accounted for separately and It is applicable both way (Reimbursement &amp; Deduction)</p> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p> <p>Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the table of adjustment data in accordance with the provisions of Sub-Clause 13.8 [Adjustments for Changes in Cost].</p>
<b>13.8 Adjustments for Changes in Cost</b>	<p>In this Sub-Clause, "table of adjustment data" means the completed table of adjustment data and factors for local and foreign currencies included in the <b>Particular Condition</b>. If there is no such table of adjustment data in <b>Particular Condition</b>, this Sub-Clause shall not apply.</p> <p>If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labour, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.</p> <p>The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae provided in Particular Conditions.</p> <p>The cost indices or reference prices stated in the Particular Condition s shall be used. If their source is in doubt, it shall be determined by the Engineer.</p> <p>In cases where the "currency of index" is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central bank of the</p>

	<p>Country, of this relevant currency on the above date for which the index is required to be applicable.</p> <p>Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.</p> <p>If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price, whichever is more favorable to the Employer.</p> <p>The weightings (coefficients) for each of the factors of cost stated in the <b>Particular Condition</b> shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.</p>
<b>14. Contract Price and Payment</b>	
<b>14.1 The Contract Price</b>	<p>Unless otherwise stated in the <b>Particular Conditions</b>:</p> <p>(a) the Contract Price shall be agreed or determined under Sub-Clause 12.3 [Evaluation] and be subject to adjustments in accordance with the Contract; inclusive of all taxes, duties, royalties and GST</p> <p>(b) the Contractor shall pay all taxes, GST, Stamp Duties, other duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs except as stated in Sub-Clause 13.7 [Adjustments for Changes in Legislation];</p> <p>(c) any quantities which may be set out in the Bill of Quantities or other Schedule are estimated quantities and are not to be taken as the actual and correct quantities:</p> <p style="padding-left: 40px;">(i) of the Works which the Contractor is required to execute, or</p> <p style="padding-left: 40px;">(ii) for the purposes of Clause 12 [Measurement and Evaluation]; and</p> <p>(d) the Contractor shall submit to the Engineer, within 28 days after the Commencement Date, a proposed breakdown of each lump sum price in the Schedules (Applicable to Lump Sum Contract Only). The Engineer may take account of the breakdown when preparing Payment Certificates, but shall not be bound by it.</p>

	<p>Notwithstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts therefor, imported by the Contractor for the sole purpose of executing the Contract shall be exempt from the payment of import duties and taxes upon importation.</p> <p>Further details regarding prevailing taxes is provided in <b>Particular Conditions</b></p>
<b>14.2 Advance Payment / Mobilization Advance</b>	<p><b>Deleted</b></p> <p><del>The Employer shall make an advance payment, as an interest-free loan for mobilization and cash flow support, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions detailed as under.</del></p> <p><del>(a) <b>Mobilization Advance:</b></del></p> <p><del>Interest free Mobilization advance shall be <b>10% of original contract value</b> payable in <b>two equal</b> instalments of 5% (Five Percent) each, in the currencies and proportions in which the Accepted Contract Amount is payable.</del></p> <p><del>Mobilization advance shall be paid against acceptable Bank Guarantee issued from a Scheduled Commercial Indian Bank or Schedule Commercial Foreign Bank (Except Cooperative Bank) having business offices in India. The value of <b>Bank Guarantee</b> taken towards security of "<b>Advance Payment</b>" / "<b>Mobilization Advance</b>" shall be <b>110%</b> of the advance amount requested by the Contractor and valid for 60 Days beyond scheduled completion time. The validity of Advance Bank Guarantee shall be extended as per extended time of contract plus 60 days, if the Advance Amount is not recovered completely.</del></p> <p><del>The <b>first installment</b> shall be paid after award of Letter of Acceptance by employer and submission of <b>Performance Guarantee / Security</b> and <b>Advance Bank Guarantee</b> by Contractor.</del></p> <p><del>The <b>second installment</b> shall be paid on production of effective and proper utilization of the first installment duly accepted and certified (with or without modification) by the Engineer. The Contractor shall be required to submit the '<b>Utilization Certificate</b>' of 1<sup>st</sup> installment along with Bank Guarantee @ 110% of 2<sup>nd</sup> installment, with his letter of request.</del></p> <p><del>The Contractor, once the 50% of mobilization advance has been recovered, shall have a onetime option to reduce the Bank Guarantee for the mobilization advance by the proportion to the amount recovered.</del></p> <p><del>(b) <b>Amortization/ Repayment of Advance Payment</b></del></p>

	<p><del>The recovery of the Advance Payment shall be done in respective currencies and shall commence when 20% of the original contract value of the work has been paid in respective currencies (in addition to the Mobilization Advance) and shall be recovered by deduction of 25% of the amount of each Interim Payment, until the total of the Mobilization Advance is recovered before payment of 60% of Contract Price.</del></p> <p><b><u>(c) Interest in case of delay in repayment of Advances</u></b></p> <p><del>i. Should there be delay in the progress and completion of work due to reasons attributable to the Contractor, as a result of which it is not possible to recover the advance amount within the assigned time period of completion, then the interest @ <b>MCLR (One Year Rate) +2%, (Marginal Cost of Funds Based Lending Rate) of SBI</b>, shall be recovered from the Contractor on balance advance amount for extended period of work till the re-payments of entire amount completes.</del></p> <p><del>ii. MCLR shall be applicable at the prevailing rate on the date of payment of advance amount in Contractor's account.</del></p> <p><del>iii. If the contract is terminated due to default of the Contractor, the 'Mobilization Advance' would be deemed as interest bearing advance @ MCLR +2%. The interest will be calculated from the first day of the month in which an advance is paid to the Contractor and it will be calculated up to the last day of the month in which the recovery is made.</del></p> <p><b><u>(d) Failure of contractor to repay the Advance Amount</u></b></p> <p><del>i. If the Contractor fails to repay the advance amount within the stipulated period of repayment as described above in Sub-Clause no. 14.2 (b) or its further extension by Employer, in such events Employer is empowered to encash the Bank Guarantee submitted by Contractor against the Advance Payment.</del></p> <p><del>ii. Employer is also empowered to encash the Advance Bank Guarantee, if the Contract is terminated or foreclosed or whatever the reasons and Advance Amount is not repaid by Contractor</del></p>
<p><b>14.3 Application for Interim Payment Certificates</b></p>	<p>The Contractor shall submit a Statement in two copies to the Engineer after the end of each month, in a form approved by the Engineer, showing in detail the amounts to which the Contractor considers himself to be entitled, together with supporting documents which shall include the report on the progress during this month in accordance with Sub-Clause 4.21 [Progress Reports].</p>

	<p>The Statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:</p> <ul style="list-style-type: none"> <li>(a) the estimated contract value of the Works executed and the Contractor's Documents produced up to the end of the month (including Variations but excluding items described in sub-paragraphs (b) to (g) below);</li> <li>(b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost];</li> <li>(c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the <b>Particular Conditions</b> to the total of the above amounts, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the <b>Particular Conditions</b>;</li> <li>(d) any amounts to be added for the advance payment and (if more than one instalment) and to be deducted for its repayments in accordance with Sub-Clause 14.2 [Advance Payment];</li> <li>(e) any amounts to be added and deducted for Plant and Materials in accordance with Sub-Clause 14.5 [Plant and Materials intended for the Works];</li> <li>(f) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [Claims, Disputes and Arbitration]; and</li> <li>(g) the deduction of amounts certified in all previous Payment Certificates.</li> </ul>
<b>14.4 Schedule of Payments</b>	<p><b><i>(This clause is replaced in PCC)</i></b></p> <p>If the Contract includes a schedule of payments specifying the instalments in which the Contract Price will be paid, then unless otherwise stated in this schedule:</p> <ul style="list-style-type: none"> <li>(a) the instalments quoted in this schedule of payments shall be the estimated contract values for the purposes of sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates];</li> <li>(b) Sub-Clause 14.5 [Plant and Materials intended for the Works] shall not apply; and</li> <li>(c) if these instalments are not defined by reference to the actual progress achieved in executing the Works, and if actual progress is found to be less or more than that on which this schedule of</li> </ul>

	<p>payments was based, then the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine revised instalments, which shall take account of the extent to which progress is less or more than that on which the instalments were previously based.</p> <p>If the Contract does not include a schedule of payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works.</p>
<p><b>14.5 Plant and Materials intended for the Works</b></p>	<p>If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3,</p> <ul style="list-style-type: none"> <li>(i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and</li> <li>(ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates].</li> </ul> <p>If the lists referred to in sub-paragraphs (b) (i) or (c) (i) below are <b>not included in the Schedules / Accepted Bill of Quantities</b>, this Sub-Clause shall not apply.</p> <p>The Engineer shall determine and certify each addition if the following conditions are satisfied:</p> <ul style="list-style-type: none"> <li>(a) the Contractor has: <ul style="list-style-type: none"> <li>(i) kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and</li> <li>(ii) submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence;</li> </ul> </li> </ul> <p>and either:</p> <ul style="list-style-type: none"> <li>(b) the relevant Plant and Materials: <ul style="list-style-type: none"> <li>(i) are those listed in the <b>Schedules for payment / Accepted Bill of Quantities</b></li> <li>(ii) when shipped,</li> <li>(iii) have been shipped to the Country, en route to the Site, in accordance with the Contract; and</li> <li>(iv) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the</li> </ul> </li> </ul>



	<p>Engineer together with evidence of payment of freight and insurance, any other documents reasonably required, and a bank guarantee in a form and issued by an entity approved by the Employer in amounts and currencies equal to the amount due under this Sub-Clause: this guarantee may be in a similar form to the form referred to in Sub-Clause 14.2 [Advance Payment] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration by proper Insurance and security;</p> <p>or</p> <p>(c) the relevant Plant and Materials:</p> <ul style="list-style-type: none"> <li>(i) are those listed in the <b>Schedules for payment /Accepted Bill of Quantitiess</b></li> <li>(ii) when delivered to the Site, and</li> <li>(iii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration with proper insurance &amp; security, and appear to be in accordance with the Contract.</li> </ul> <p>(d) The amount to be certified shall be the equivalent of eighty percent (80%) of the Engineer's determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.</p> <p>(e) The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.</p>
<p><b>14.6 Issue of Interim Payment Certificates</b></p>	<p>No amount will be certified or paid until the Employer has received and approved the Performance Security. Thereafter, the Engineer shall, within 28 days after receiving a Statement and supporting documents, deliver to the Employer and to the Contractor an Interim Payment Certificate which shall state the amount which the Engineer fairly determines to be due, with all supporting particulars for any reduction or withholding made by the Engineer on the Statement if any.</p>

	<p>However, prior to issuing the Taking-Over Certificate for the Works, the Engineer shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificates (if any) stated in the <b>Particular Conditions</b>. In this event, the Engineer shall give notice to the Contractor accordingly.</p> <p>An Interim Payment Certificate shall not be withheld for any other reason, although:</p> <ul style="list-style-type: none"> <li>(a) if any thing supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or</li> <li>(b) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer, the value of this work or obligation may be withheld until the work or obligation has been performed.</li> </ul> <p>The Engineer may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer's acceptance, approval, consent or satisfaction.</p>
<p><b>14.7 Payment</b></p>	<p>The Employer shall pay to the Contractor:</p> <ul style="list-style-type: none"> <li>(a) the first instalment of the advance payment within 42 days after issuing the Letter of Acceptance or within 21 days after receiving the documents in accordance with Sub-Clause 4.2 [Performance Security] and Sub-Clause 14.2 [Advance Payment], whichever is later;</li> <li>(b) the amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents; or, at a time when the Bank's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the amount shown on any statement submitted by the Contractor within 14 days after such statement is submitted, any discrepancy being rectified in the next payment to the Contractor; and</li> <li>(c) the amount certified in the Final Payment Certificate within 56 days after the Employer receives this Payment Certificate; or, at a time when the Bank's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the undisputed amount shown in the Final Statement within 56 days after the date of notification of the suspension in accordance with Sub-Clause 16.2 [Termination by Contractor].</li> </ul>

	<p>d) The Employer may, at its sole discretion, authorise the Engineer to perform the functions of Employer specified in the GC Clause 14.7. The Employer may advise arrangements for direct payment by the Bank. The procedure to be followed for such direct payment by the Bank shall be advised to the Contractor by the Engineer.</p> <p>e) If and to the extent that the Pricing Document expressly specifies in relation to a Cost Centre that the Contractor is entitled to payment in a currency other than Indian Rupees, or the Engineer makes a determination of Cost in a currency other than Indian Rupees, all such payments shall be made in the relevant foreign currency.</p> <p>f) In calculating the amount payable to the Contractor for the Rupee portion, for each item, sums of less than Fifty Paise shall be omitted and sums of Fifty Paise and more, up to one Rupee, shall be reckoned as one Rupee. The net payments in foreign currencies, if applicable, shall also be rounded off to 'zero' decimal places.</p> <p>g) All payments to the Contractor for the Rupee portion shall be made by crossed cheque/ RTGS/NEFT or appropriate on line payment method, but no cheque will be issued for an amount of less than Rs. 1000/-. This shall not apply to the final payment.</p> <p>h) All payments to the Contractor for the foreign currency portion shall be through a Letter of Credit. All bank charges of Employer's Banker shall be borne by the Employer and that of Contractor's Banker shall be borne by the Contractor. The charges towards confirmation (if required by the Contractor) shall be borne by the Contractor. Extension of validity of L/C need is not envisaged. However, should be validity of L/C need to be extended, for reasons solely attributable to Employer, the charges for such extension will be borne by the Employer. In all other cases, L/C charges for extension or otherwise shall be borne by the Contractor.</p> <p><b>Payment procedure shall be as under:</b></p> <p>i) The Contractor shall submit preferably the monthly bill for payment to the Engineer.</p> <p>ii) Immediately after the submission of bill with all relevant documents / enclosures, 80 % amount of the bill shall be released within 7 working days approximately.</p> <p>iii) The remaining 20% of the bill shall be released after detail scrutiny and subsequent comments / Recommendations by</p>
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	<p>Engineer within 28 days from the date of submission of bill by Contractor.</p> <p>iv) If any adverse comments regarding the workmanship or the quality of the work done in the previous bill is made by the Engineer then appropriate and suitable amount shall be recovered from successive bills.</p> <p>v) Payment of the amount due in each currency shall be made into the bank account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.</p> <p>vi) The Employer shall pay to the Contractor the amount certified in each Interim Payment Certificate. Each interim payment certificate will have two components;</p> <p style="padding-left: 40px;">(b) Value of the work/goods/services (without taxes/ duties levies/ cess etc.).</p> <p style="padding-left: 40px;">(c) Taxes/ duties levies/cess/GST etc</p>
<b>14.8 Delayed Payment</b>	<p>(a) If the Contractor does not receive payment / certificate for acceptance of payment in accordance with GC Clause 14.7 above, the Contractor shall be entitled to receive interest on the amount unpaid during the period of delay. This period of delay shall be deemed to commence from the first working day after 56 calendar days from the date of issue of the Interim Payment Certificate by the Engineer.</p> <p>(b) The interest shall be calculated at an interest @ MCLR (One Year Rate) (Marginal Cost of Funds Based Lending Rate) of SBI.</p> <p>(c) Rate of MCLR (One Year Rate) shall be applicable of first working day after 56 calendar days from the date of issue of the Interim Payment Certificate by the Engineer.</p> <p>(d) The Contractor shall submit their claim for the interest for the above period of delay along with detailed reasons for the said delays to the Engineer within 14 days of the expiry of the 56 days period. The claimed interest shall be payable to the Contractor only if it is determined by the Engineer that the delays are solely attributable to the Employer.</p> <p>(e) The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.</p>

<p><b>14.9 Payment of Retention Money</b></p>	<p><b>(If applicable &amp; specifically mentioned in Particular Conditions )</b></p> <p>(a) When the Taking-Over Certificate has been issued for the Works, the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor.</p> <p>(b) If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) of the proportion calculated by dividing the billed contract value of the Section or part, by the Awarded final Contract Price. Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor.</p> <p>(d) If a Taking-Over Certificate was issued for a Section, a proportion of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section. This proportion shall be half (50%) of the proportion calculated by dividing the billed contract value of the Section by the awarded final Contract Price.</p> <p>(e) However, if any work remains to be executed under Clause 11 [Defects Liability], the Engineer shall be entitled to withhold certification of the final cost of this work until it has been executed. When calculating these proportions, no account shall be taken of any adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost].</p> <p>(f) Unless otherwise stated in the Particular Conditions, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Employer and issued by a Scheduled Commercial Indian Bank / Schedule Commercial Foreign bank (Except Cooperative Bank) having business office in India acceptable to the Employer, for the second half of the Retention Money.</p> <p>(g) The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2. On receipt by the Employer of the required guarantee, the</p>
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	<p>Engineer shall certify and the Employer shall pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.</p>
<b>14.10 Statement at Completion</b>	<p>Within 84 days after receiving the Taking-Over Certificate for the Works, the Contractor shall submit to the Engineer two copies of a Statement at completion with supporting documents, in accordance with Sub-Clause 14.3 [Application for Interim Payment Certificates], showing:</p> <ul style="list-style-type: none"> <li>(a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,</li> <li>(b) any further sums which the Contractor considers to be due, and</li> <li>(c) an estimate of any other amounts which the Contractor considers will become due to him under the Contract. Estimated amounts shall be shown separately in this Statement at completion.</li> </ul> <p>The Engineer shall then certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates].</p>
<b>14.11 Application for Final Payment Certificate</b>	<p>Within 56 days after receiving the Performance Certificate, the Contractor shall submit, to the Engineer, two copies of a draft final statement with supporting documents showing in detail in a form approved by the Engineer:</p> <ul style="list-style-type: none"> <li>(a) the value of all work done in accordance with the Contract, and</li> <li>(b) any further sums which the Contractor considers to be due to him under the Contract or otherwise.</li> </ul> <p>If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require within 28 days from receipt of said draft and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".</p> <p>However if, following discussions between the Engineer and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer shall deliver to the Employer (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement. Thereafter, if the dispute is finally resolved under Sub-Clause 20.4 [Obtaining Dispute Board's</p>

	<p>Decision] or Sub-Clause 20.5 [Amicable Settlement], the Contractor shall then prepare and submit to the Employer (with a copy to the Engineer) a Final Statement.</p> <p>Before issue of Final Payment Certificate Contractor shall sign &amp; submit a <b>"No Dues Certificate/ No Claim Certificate"</b> in the format provided by Engineer.</p>
<b>14.12 Discharge</b>	<p>When submitting the Final Statement, the Contractor shall submit a discharge which confirms that the total of the Final Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the outstanding balance of this total, in which event the discharge shall be effective on such date.</p>
<b>14.13 Issue of Final Payment Certificate</b>	<p>Within 28 days after receiving the Final Statement and discharge in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall deliver, to the Employer and to the Contractor, the Final Payment Certificate which shall state:</p> <ul style="list-style-type: none"> <li>(a) the amount which he fairly determines is finally due, and</li> <li>(b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled, the balance (if any) due from the Employer to the Contractor or from the Contractor to the Employer, as the case may be.</li> </ul> <p>If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall request the Contractor to do so. If the Contractor fails to submit an application within a period of 28 days, the Engineer shall issue the Final Payment Certificate for such amount as he fairly determines to be due.</p>
<b>14.14 Cessation of Employer's Liability</b>	<p>The Employer shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:</p> <ul style="list-style-type: none"> <li>(a) in the Final Statement and also</li> <li>(b) (except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.10 [Statement at Completion].</li> </ul>

	However, this Sub-Clause shall not limit the Employer's liability under his indemnification obligations, or the Employer's liability in any case of fraud, deliberate default or reckless misconduct by the Employer.
<b>14.15 Currencies of Payment</b>	<p>The Contract Price shall be paid in the currency or currencies named in the Schedule of Payment Currencies or <b>Particular Conditions</b>. If more than one currency is so named, payments shall be made as follows:</p> <ul style="list-style-type: none"> <li>(a) if the Accepted Contract Amount was expressed in Local Currency only: <ul style="list-style-type: none"> <li>(i) the proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Schedule of Payment Currencies, except as otherwise agreed by both Parties;</li> <li>(ii) payments and deductions under Sub-Clause 13.5 [Provisional Sums] and Sub-Clause 13.7 [Adjustments for Changes in Legislation] shall be made in the applicable currencies and proportions; and</li> <li>(iii) other payments and deductions under sub-paragraphs (a) to (d) of Sub-Clause 14.3 [Application for Interim Payment Certificates] shall be made in the currencies and proportions specified in sub-paragraph (a) (i) above;</li> </ul> </li> <li>(b) payment of the damages specified in the <b>Particular Conditions</b>, shall be made in the currencies and proportions specified in the Schedule of Payment Currencies;</li> <li>(c) other payments to the Employer by the Contractor shall be made in the currency in which the sum was expended by the Employer, or in such currency as may be agreed by both Parties;</li> <li>(d) if any amount payable by the Contractor to the Employer in a particular currency exceeds the sum payable by the Employer to the Contractor in that currency, the Employer may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and</li> <li>(e) if no rates of exchange are stated in the Schedule of Payment Currencies, they shall be those prevailing on the <b>Base Date</b> and determined by the central bank of the Country i.e. <b>Reserve Bank of India</b></li> </ul>
<b>14.16. Recovery of Money due to the Employer</b>	All damages (including, without limitation, liquidated damages), costs, charges, expenses, debts, or sums for which the Contractor is liable to the Employer under any provision of the Contract may be deducted by the Employer from monies due to the Contractor under the Contract



	<p>(including, without limitation, liquidated damages) and the Employer/ Engineer shall have the power to recover any balance not so deducted from monies due to the Contractor under any other contract between the Employer and the Contractor.</p> <p>When the Contractor has assigned to a third party the right to receive monies due, or, to become due, under the Contract to the Contractor or charged such monies in favour of a third party, the Employer's right to deduct damages (including without limitation liquidated damages), costs, charges, expenses, debts or sums for which the Contractor is liable to the Employer from monies due to the Contractor under the Contract shall be limited to the right expressed above.</p>
<b>15. Termination by Employer</b>	
<b>15.1 Notice to Correct</b>	<p>If the Contractor fails to carry out any obligation under the Contract, the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.</p>
<b>15.2 Termination by Employer</b>	<p>The Employer shall be entitled to terminate the Contract if the Contractor:</p> <ul style="list-style-type: none"> <li>(a) fails to comply with Sub-Clause 4.2 [Performance Security] or with a notice under Sub-Clause 15.1 [Notice to Correct],</li> <li>(b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,</li> <li>(c) without reasonable excuse fails: <ul style="list-style-type: none"> <li>(i) to proceed with the Works in accordance with Clause 8 [Commencement, Delays and Suspension], or</li> <li>(ii) to comply with a notice issued under Sub-Clause 7.5 [Rejection] or Sub-Clause 7.6 [Remedial Work], within 28 days after receiving it,</li> </ul> </li> <li>(d) subcontracts the whole of the Works or assigns the Contract without the required agreement,</li> <li>(e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or</li> <li>(f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:</li> </ul>

	<p>(i) for doing or forbearing to do any action in relation to the Contract, or</p> <p>(ii) for showing or forbearing to show favour or disfavour to any person in relation to the Contract,</p> <p>or if any of the Contractor's Personnel, agents or Sub-Contractor gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination.</p> <p>In any of these events or circumstances, the Employer may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f), the Employer may by notice terminate the Contract immediately.</p> <p>(g) In case the Contractor fails to adhere to the agreed programme of work by margin of 10% of the stipulated period or 21 days, whichever is earlier, or fails to complete the Works or parts of the Works within the stipulated or extended period of completion, or is unlikely to complete the whole Work or part thereof within time because of poor record of progress, the Employer at its sole discretion may terminate only <b>part/ limit the scope / de-scope part of the work</b> of the contract also by taking out some part of the total scope of work and may complete or arrange for any other entity through the process of Open/ Limited/ Single Tender/ by calling quotations or any other manner as deemed fit at the risk and cost of the contractor. In such case, the additional financial implications (if any), shall be debited/ recovered from the any monies due to Contractor and/or performance security. <b>Such recovery shall be Limited to 10% (Ten Percent) of the Contract Price.</b></p> <p>(h) If Contractor submits fake/ forged/ fabricated documents/ false, incorrect, misleading information / data/ design, either during the bidding or thereafter during execution of the work or after completion but before the final bill, the contract can be terminated and appropriate action in terms of forfeiture of Performance Guarantee/ Security Deposit /Retention Money/ EMO/ Bid Security (as the case may be) shall be done and blacklisting of Contractor may be done by Employer.</p> <p>The Employer's decision to terminate the Contract shall not prejudice any other rights of the Employer, under the Contract or otherwise.</p> <p>The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents</p>
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	<p>made by or for him, to the Engineer. However, the Contractor shall use his best efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.</p> <p>After termination, the Employer may complete the Works and/or arrange for any other entities to do so. The Employer and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor.</p> <p>The Employer shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Employer, these items may be sold by the Employer in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.</p>
<b>15.3 Valuation at Date of Termination</b>	<p>As soon as practicable after a notice of termination under Sub-Clause 15.2 [Termination by Employer] has taken effect, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.</p>
<b>15.4 Payment after Termination</b>	<p>After a notice of termination under Sub-Clause 15.2 [Termination by Employer] has taken effect, the Employer may:</p> <ul style="list-style-type: none"> <li>(a) proceed in accordance with Sub-Clause 2.5 [Employer's Claims],</li> <li>(b) withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established, and/or</li> <li>(c) recover from the Contractor any losses and damages incurred by the Employer and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation at Date of Termination]; such recovery shall be limited to 10% (Ten Percent) of the Contract Price. After recovering any such losses, damages and extra costs, the Employer shall pay any balance to the Contractor.</li> <li>(d) On termination of contract due to Contractor's default <b>(except in case of part termination/ de-scoping under para 15.2 (g))</b> the <b>Performance Security/ Retention Money shall be forfeited/encashed</b>. The balance work shall be got done</li> </ul>

	<p>independently at risk and cost of the failed Contractor. The Risk and Cost amount shall be recovered from the Performance Security and any other monies due to the Contractor under this contract or any other contract. However, such recovery shall be Limited to 10% (Ten Percent) of the Contract Price. The failed Contractor shall be debarred from participating in the tender for executing the balance work. If the failed Contractor is a JV or a partnership firm, then every member/partner of such JV or partnership firm shall be debarred from participating in the tender for the balance work either in his/her individual capacity or as a partner of any other JV/partnership firm.</p>
<p><b>15.5 Employer's Entitlement to Termination for Convenience</b></p>	<p>The Employer shall be entitled to terminate the Contract, at any time for the Employer's convenience, by giving notice of such termination to the Contractor. The termination shall take effect 28 days after the later of the dates on which the Contractor receives this notice or the Employer returns the Performance Security. The Employer shall not terminate the Contract under this Sub-Clause in order to execute the Works himself or to arrange for the Works to be executed by another Contractor or to avoid a termination of the Contract by the Contractor under Clause 16.2 [Termination by Contractor].</p> <p>After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment] and shall be paid in accordance with Sub-Clause 16.4 [Payment on Termination].</p>
<p><b>15.6 Corrupt or Fraudulent Practices</b></p>	<p>If the Employer determines, based on reasonable evidence, that the Contractor has engaged in corrupt, fraudulent, collusive or coercive practices, in competing for or in executing the Contract, then the Employer may, after giving 14 days notice to the Contractor, terminate the Contract and expel him from the Site, and the provisions of Clause 15 shall apply as if such termination had been made under Sub-Clause 15.2 [Termination by Employer].</p> <p>Should any employee of the Contractor be determined, based on reasonable evidence, to have engaged in corrupt, fraudulent or coercive practice during the execution of the work then that employee shall be removed in accordance with Sub-Clause 6.9 [Contractor's Personnel].</p> <p>For the purposes of this Sub-Clause:</p>

	<p>(i) "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;<sup>1</sup></p> <p>(ii) "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;<sup>2</sup></p> <p>(iii) "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;<sup>3</sup></p> <p>(iv) "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;<sup>4</sup></p> <p>(v) "obstructive practice" is</p> <p>(a) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or</p> <p>(b) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under Sub-Clause 1.15 [Inspections and Audits by the Bank].</p>
<b>16. Suspension and Termination by Contractor</b>	
<b>16.1 Contractor's Entitlement to Suspend Work</b>	<p>If the Engineer fails to certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates] or the Employer fails to comply with Sub-Clause 14.7 [Payment], the Contractor may, after giving not less than 21 days' notice to the Employer, suspend work (or reduce the rate of progress of work) unless and until the Contractor has received the Payment Certificate, reasonable evidence or payment, as the case may be and as described in the notice.</p>

"Another party" refers to a public official acting in relation to the procurement process or contract execution]. In this context, "public official" includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.

"Party" refers to a public official; the terms "benefit" and "obligation" relate to the procurement process or contract execution; and the "act or omission" is intended to influence the procurement process or contract execution.

"Parties" refers to participants in the procurement process (including public officials) attempting to establish bid prices at artificial, non competitive levels.

<sup>4</sup> "Party" refers to a participant in the procurement process or contract execution.

	<p>The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.8 [Delayed Payment] and to termination under Sub-Clause 16.2 [Termination by Contractor].</p> <p>If the Contractor subsequently receives such Payment Certificate, evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.</p> <p>If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> <li>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</li> <li>(b) payment of any such Cost plus profit, which shall be included in the Contract Price.</li> </ul> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
<b>16.2 Termination by Contractor</b>	<p>The Contractor shall be entitled to terminate the Contract if:</p> <ul style="list-style-type: none"> <li>(a) the Engineer fails, within 56 days after receiving a Statement and supporting documents, to issue the relevant Payment Certificate,</li> <li>(b) the Contractor does not receive the amount due under an Interim Payment Certificate within 42 days after the expiry of the time stated in Sub-Clause 14.7 [Payment] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [Employer's Claims]),</li> <li>(c) the Employer substantially fails to perform his obligations under the Contract in such manner as to materially and adversely affect the economic balance of the Contract and/or the ability of the Contractor to perform the Contract,</li> <li>(d) the Employer fails to comply with Sub-Clause 1.6 [Contract Agreement] or Sub-Clause 1.7 [Assignment],</li> <li>(e) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [Prolonged Suspension], or</li> <li>(f) the Employer becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit</li> </ul>

	<p>of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.</p> <p>(g) the Contractor does not receive the Engineer's instruction recording the agreement of both Parties on the fulfilment of the conditions for the Commencement of Works under Sub-Clause 8.1 [Commencement of Works].</p> <p>In any of these events or circumstances, the Contractor may, upon giving 14 days' notice to the Employer, terminate the Contract. However, in the case of sub-paragraph (e) or (f), the Contractor may by notice terminate the Contract immediately.</p> <p>In the event the Bank suspends the loan or credit from which part or whole of the payments to the Contractor are being made, if the Contractor has not received the sums due to him upon expiration of the 14 days referred to in Sub-Clause 14.7 [Payment] for payments under Interim Payment Certificates, the Contractor may, without prejudice to the Contractor's entitlement to financing charges under Sub-Clause 14.8 [Delayed Payment], take one of the following actions, namely (i) suspend work or reduce the rate of work under Sub-Clause 16.1 above, or (ii) terminate the Contract by giving notice to the Employer, with a copy to the Engineer, such termination to take effect 14 days after the giving of the notice.</p> <p>The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise..</p>
<b>16.3 Cessation of Work and Removal of Contractor's Equipment</b>	<p>After a notice of termination under Sub-Clause 15.5 [Employer's Entitlement to Termination for Convenience], Sub-Clause 16.2 [Termination by Contractor] or Sub-Clause 19.6 [Optional Termination, Payment and Release] has taken effect, the Contractor shall promptly:</p> <p>(a) cease all further work, except for such work as may have been instructed by the Engineer for the protection of life or property or for the safety of the Works,</p> <p>(b) hand over Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and</p> <p>(c) remove all other Goods from the Site, except as necessary for safety, and leave the Site.</p>
<b>16.4 Payment on Termination</b>	<p>After a notice of termination under Sub-Clause 16.2 [Termination by Contractor] has taken effect, the Employer shall promptly:</p> <p>(a) return the Performance Security to the Contractor,</p>

	<p>(b) pay the Contractor in accordance with Sub-Clause 19.6 [Optional Termination, Payment and Release], and</p> <p>(c) pay to the Contractor the amount of any loss or damage sustained by the Contractor as a result of this termination.</p>
<b>17. Risk and Responsibility</b>	
<b>17.1 Indemnities</b>	<p>The Contractor shall indemnify and hold harmless the Employer, the Engineer, the Designated Contractors, representatives and employees from and against all actions, suits, proceedings, claims, damages, losses, expenses and demands of every nature and description, by reasons of any act or omissions, any negligence, willful act or breach on the Contract by the Contractor or his representative or his employees in the execution of the Works, including professional services provided by the Contractor or in the guarding the same.</p> <p>These indemnification obligations shall include but not be limited to claims, damages, losses, damage proceedings, charges and expenses which are attributable to:</p> <ul style="list-style-type: none"> <li>a) sickness, or disease, or death of, or injury to any person; and</li> <li>b) loss of, or damage to, or destruction of any property (other than the Works) including consequential loss of use; and</li> <li>c) loss, damage or costs arising from the carriage of Plant, Rolling Stock and Materials and/or ownership or chartering of marine vessels by the Contractor, or any sub-contractor of any tier.</li> </ul> <p>The Contractor shall also indemnify and save harmless the Employer from and against all claims and proceedings on account of infringements of patents rights, design, trademark name etc as detailed out in the GC.</p> <p>All sums payable by way of compensation under these conditions shall be considered reasonable compensation payable to the Employer, without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.</p> <p>The decision of the Engineer as to compensation claimed shall be final and binding.</p>
<b>17.2 Contractor's Care of the Works</b>	<p>The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [Taking Over of the Works and Sections]) for the Works, when responsibility for the care of the Works shall pass to the Employer. If a Taking-Over Certificate is issued (or is so deemed to be issued) for</p>



	<p>any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Employer.</p> <p>After responsibility has accordingly passed to the Employer, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.</p> <p>If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [Employer's Risks], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.</p> <p>The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.</p>
<b>17.3 Employer's Risks</b>	<p>The risks referred to in Sub-Clause 17.4 [Consequences of Employer's Risks] below, insofar as they directly affect the execution of the Works in the Country, are:</p> <ul style="list-style-type: none"> <li>(a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,</li> <li>(b) rebellion, terrorism, sabotage/ lockdown/ lockup by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,</li> <li>(c) riot, commotion, disorder, strike or lockout/ lockdown by persons other than the Contractor's Personnel,</li> <li>(d) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity,</li> <li>(e) pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds,</li> <li>(f) use or occupation by the Employer of any part of the Permanent Works, except as may be specified in the Contract,</li> <li>(g) design of any part of the Works by the Employer's Personnel or by others for whom the Employer is responsible, and</li> <li>(h) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably</li> </ul>

	<p>have been expected to have taken adequate preventive precautions like epidemic/ pandemic, unprecedented and unpredictable adverse natural conditions.</p> <p><b>Note: - If any of the above is included or covered under any kind of insurance pertaining to the Contract, it shall be treated as excluded from the employer's risk.</b></p>
<b>17.4 Consequences of Employer's Risks</b>	<p>If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer and shall rectify this loss or damage to the extent required by the Engineer.</p> <p>If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p> <ul style="list-style-type: none"> <li>(a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and</li> <li>(b) payment of any such Cost, which shall be included in the Contract Price, (if not covered under any kind of insurance obtained by contractor for the Work, under any insurance scheme). In the case of sub-paragraphs (f) and (g) of Sub-Clause 17.3 [Employer's Risks], Cost plus profit shall be payable.</li> </ul> <p>After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
<b>17.5 Intellectual and Industrial Property Rights</b>	<p>In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trade mark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.</p> <p>Whenever a Party does not give notice to the other Party of any claim within 28 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.</p> <p>The Employer shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:</p> <ul style="list-style-type: none"> <li>(a) an unavoidable result of the Contractor's compliance with the Contract, or</li> </ul>

	<p>(b) a result of any Works being used by the Employer:</p> <ul style="list-style-type: none"> <li>(i) for a purpose other than that indicated by, or reasonably to be inferred from, the Contract, or</li> <li>(ii) in conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract.</li> </ul> <p>The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.</p> <p>If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.</p> <p>The Contractor shall indemnify the Employer and the Engineer from and against all claims and proceedings on account of infringement (or alleged infringement) of any patent rights, registered designs, copyright, design, trademark, trade name, know-how or other intellectual property rights in respect of the Works, Contractor's Equipment, machines, work method, or Plant, or Materials, or anything whatsoever required for the Works and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall pay all traffic surcharges and other royalties, licence fees, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials, machine, process, systems, work methods, or Contractor's Equipment required for the Works. The Contractor shall, in the event of infringement of Intellectual Property Rights, rectify, modify or replace at his own cost the Works, Plant or materials or anything whatsoever required for the Works so that infringement no more exist or in the alternative shall procure necessary rights/license so that there is no infringement of Intellectual Property Rights.</p> <p>The Contractor shall be promptly notified of any claim under this Sub-Clause made against the Employer. The Contractor shall, at his cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Employer or the Engineer shall not make any admission, which might be prejudicial to</p>
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	<p>the Contractor, unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of Contractor failing to act at Engineer's notice, the Employer shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under this Contract or any other Contract.</p> <p>Insofar as the patent, copyright or other intellectual property rights in any Plant, Design Data, plans, calculations, drawings, documents, Materials, know-how and information relating to the Works shall be vested in the Contractor, the Contractor shall grant to the Employer, his successors and assignees a royalty-free, non-exclusive and irrevocable licence (carrying the right to grant sub-licences) to use and reproduce any of the works, designs or inventions incorporated and referred to in such Plant, documents or Materials and any such know-how and information for all purposes relating to the Works (including without limitation the design, manufacture, installation, reconstruction, Testing, commissioning, completion, reinstatement, extension, repair and operation of the Works).</p> <p>If any patent, registered design or software is developed by the Contractor specifically for the Works, the title thereto shall vest in the Employer and the Contractor shall grant to the Employer a non-exclusive irrevocable and royalty-free licence (carrying the right to grant sub-licence) to use, repair, copy, modify, enhance, adapt and translate in any form such Software for his own use.</p> <p>If the Contractor uses proprietary software for the purpose of storing or utilising records the Contractor shall obtain at his own expense the grant of a licence or sub-licence to use such software in favour of the Employer and shall pay such licence fee or other payment as the grantor of such licence may require provided that the use of such software under the licence may be restricted to use relating to the design, construction, reconstruction, manufacture, completion, reinstatement, extension, repair and operation of the Works or any part thereof.</p> <p>The Contractor's permission referred to above shall be given, inter alia, to enable the Employer to disclose (under conditions of confidentiality satisfactory to the Contractor) program and documentation for a third party to undertake the performance of services for the Employer in respect of such programs and documentation.</p> <p>If any software is developed under the Contract or used by the Contractor for the purposes of storing or utilising records over which the Contractor or a third party holds title or other rights, the Contractor shall permit or obtain for the Employer (as the case may require) the</p>
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	<p>right to use and apply that Software free of additional charge (together with any modifications, improvements and developments thereof) for the purpose of the design, manufacture, installation, reconstruction, testing, commissioning, completion, reinstatement, extension, repair, modification or operation of the Works, or any part thereof, or for the purpose of any Dispute.</p> <p>The Employer reserves the right to use other Software on or in connection with the Works.</p>
<b>17.6 Limitation of Liability</b>	<p>Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Sub-Clause 8.7 [Delay Damages]; Sub-Clause 11.2 [Cost of Remedying Defects]; Sub-Clause 15.4 [Payment after Termination]; Sub-Clause 16.4 [Payment on Termination]; Sub-Clause 17.1 [Indemnities]; Sub-Clause 17.4(b) [Consequences of Employer's Risks] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights].</p> <p>The total liability of the Contractor to the Employer, under or in connection with the Contract other than under Sub-Clause 4.19 [Electricity, Water and Gas], Sub-Clause 4.20 [Employer's Equipment and Free-Issue Materials], Sub-Clause 17.1 [Indemnities] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights], shall not exceed the sum resulting from the application of a multiplier (less or greater than one) to the Accepted Contract Amount, as stated in the <b>Particular Conditions</b>, or (if such multiplier or other sum is not so stated) the Accepted Contract Amount.</p> <p>This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.</p>
<b>17.7 Use of Employer's Accommodation /Facilities</b>	<p>The Contractor shall take full responsibility for the care of the Employer provided accommodation and facilities, if any, as detailed in <b>Particular Conditions</b>, from the respective dates of hand-over to the Contractor until cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).</p> <p>If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Employer is liable, the Contractor shall, at his own cost, rectify the loss or damage to the satisfaction of the Engineer.</p>

## 18. Insurance

<p><b>18.1 General Requirements for Insurances</b></p>	<p>In this Clause, "<b>Insuring Party</b>" means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause. Insuring Party is defined in <b>Particular Conditions</b></p> <p>Wherever the Contractor is the Insuring Party, each insurance shall be effected with insurers and in terms approved by the Employer. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.</p> <p>The Contractor shall obtain all insurances required in the Contract from Insurance companies operating in India in the name of Employer as a prime beneficiary specified in <b>Particular Conditions</b></p> <p>Insurances to cover risks within India as well as Marine and Transit Insurances (if applicable) shall invariably be effected with an Indian Insurance Company.</p> <p>Wherever the Employer is the Insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.</p> <p>If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Employer shall act for Employer's Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the Insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.</p> <p>Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.</p> <p>The relevant Insuring Party shall, within the respective periods stated in the <b>Particular Conditions</b> (calculated from the Commencement Date), submit to the other Party:</p> <p>(a) evidence that the insurances described in this Clause have been effected, and</p>
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	<p>(b) copies of the policies for the insurances described in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment] and Sub-Clause 18.3 [Insurance against Injury to Persons and Damage to Property].</p> <p>(c) In event of failure to submit required insurances, penal provision as described in <b>Particular Conditions</b> shall be applicable.</p> <p>When each premium is paid, the Insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the Insuring Party shall also give notice to the Engineer.</p> <p>Each Party shall comply with the conditions stipulated in each of the insurance policies. The Insuring Party shall keep the insurers informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.</p> <p>Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.</p> <p><b>If the Insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract, or fails to provide satisfactory evidence and copies of policies in accordance with this Sub-Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due.</b></p> <p>The Insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.</p> <p>Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor or the Employer, under the other terms of the Contract or otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/or the Employer in accordance with these obligations, liabilities or responsibilities. However, if the Insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the Insuring Party.</p> <p>Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [Employer's Claims] or Sub-Clause 20.1 [Contractor's Claims], as applicable.</p>
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	<p>The Contractor shall be entitled to place all insurance relating to the Contract (including, but not limited to the insurance referred to Clause 18) with insurers from any eligible source country.</p>
<p><b>18.2 Insurance for Works and Contractor's Equipment</b></p>	<p>The Insuring Party shall insure the Works, Supplies, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under sub-paragraph (a) of Sub-Clause 18.1 [General Requirements for Insurances], until the date of issue of the Taking-Over Certificate for the Works.</p> <p>The Insuring Party shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations (including those under Clause 11 [Defects Liability]).</p> <p>The Insuring Party shall insure the Contractor's Equipment for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.</p> <p>Unless otherwise stated in the <b>Particular Conditions</b>, insurances under this Sub-Clause:</p> <ul style="list-style-type: none"> <li>(a) shall be effected and maintained by the Contractor as Insuring Party,</li> <li>(b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated to the Party actually bearing the costs of rectifying the loss or damage,</li> <li>(c) shall cover all loss and damage from any cause not listed in Sub-Clause 17.3 [Employer's Risks],</li> <li>(d) shall also cover, to the extent specifically required in the bidding documents of the Contract, loss or damage to a part of the Works which is attributable to the use or occupation by the Employer of another part of the Works, and loss or damage from the risks listed in sub-paragraphs (c), (g) and (h) of Sub-Clause 17.3 [Employer's Risks], excluding (in each case) risks which are not insurable at commercially reasonable terms, with deductibles per occurrence of not more than the amount stated in the <b>Particular Conditions</b> (if an amount is not so stated, this sub-paragraph (d) shall not apply), and</li> </ul>



	<p>(e) may however exclude loss of, damage to, and reinstatement of:</p> <ul style="list-style-type: none"> <li>(i) a part of the Works which has been already constructed by Employer or other Contractor and is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),</li> <li>(ii) a part of the Works which has been already constructed by Employer or other Contractor and is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, materials or workmanship,</li> <li>(iii) a part of the Works which has been taken over by the Employer, except to the extent that the Contractor is liable for the loss or damage, and</li> <li>(iv) Goods while they are not in the Country (not reached at site), subject to Sub-Clause 14.5 [Plant and Materials intended for the Works].</li> </ul> <p>(f) The insurance shall be obtained by Contractor as an Insuring Party but the prime beneficiary shall be Employer.</p> <p>(g) The Contractor shall obtain Comprehensive All Risk (CAR) insurance policies taking in to consideration of all risk involved in the contract duly covering Marine/Transit (if applicable) &amp; others risks described in Contract and perceived by contractor as per nature of work for values equivalent to the <b>Contract value</b>. The applicability of CAR shall be specifically mentioned in Particular Conditions.</p> <p>(h) If Contract includes design also, Contractor shall obtain <b>Professional Indemnity Insurance (PII)</b>, equivalent to the amount of design cost of the work. The design cost (if design cost is not a separate item in the Financial Bid and work is on Design &amp; Build basis contract or Item of work are composite item inclusive design) shall be declared by Contractor with certificate of <b>Chartered Accountant</b>. Such <b>Professional Indemnity Insurance</b> shall be valid till the period as specified in <b>Particular Conditions</b>.</p> <p>(i) All Insurance policies except <b>Professional Indemnity Insurance</b> shall be valid till the period as specified in <b>Particular Conditions</b>, beyond expiry of OLP. The policy shall include insurance for the complete contract value.</p>
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	<p>If, more than one year after the Base Date, the cover described in subparagraph (d) above ceases to be available at commercially reasonable terms, the Contractor shall (as Insuring Party) give notice to the Employer, with supporting particulars. The Employer shall then (i) be entitled subject to Sub-Clause 2.5 [Employer's Claims] to payment of an amount equivalent to such commercially reasonable terms as the Contractor should have expected to have paid for such cover, and (ii) be deemed, unless he obtains the cover at commercially reasonable terms, to have approved the omission under Sub-Clause 18.1 [General Requirements for Insurances].</p>
<p><b>18.3 Insurance against Injury to Persons and Damage to Property</b></p>	<p>The Insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 18.4 [Insurance for Contractor's Personnel]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.</p> <p>This insurance shall be for a limit per occurrence of not less than the amount stated in the <b>Particular Conditions</b>, with no limit on the number of occurrences. If an amount is not stated in the <b>Particular Conditions</b>, this Sub-Clause shall not apply.</p> <p>Unless otherwise stated in the <b>Particular Conditions</b>, the insurances specified in this Sub-Clause:</p> <ul style="list-style-type: none"> <li>(a) shall be effected and maintained by the Contractor as Insuring Party,</li> <li>(b) shall be in the joint names of the Parties,</li> <li>(c) shall be extended to cover liability for all loss and damage to the Employer's property (except things insured under Sub-Clause 18.2) arising out of the Contractor's performance of the Contract, and</li> <li>(d) may however exclude liability to the extent that it arises from: <ul style="list-style-type: none"> <li>(i) the Employer's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works,</li> <li>(ii) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any defects, and</li> </ul> </li> </ul>

	(iii) a cause listed in Sub-Clause 17.3 [Employer's Risks], except to the extent that cover is available at commercially reasonable terms.
<b>18.4 Insurance for Contractor's Personnel</b>	<p>The Contractor shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.</p> <p>The insurance shall cover the Employer and the Engineer against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.</p> <p>The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Sub Contractor's employees, the insurance may be effected by the Sub Contractor, but the Contractor shall be responsible for compliance with this Clause.</p>
<b>19. Force Majeure</b>	
<b>19.1 Definition of Force Majeure</b>	<p>In this Clause, "Force Majeure" means an exceptional event or circumstance:</p> <ul style="list-style-type: none"> <li>(a) which is beyond a Party's control,</li> <li>(b) which such Party could not reasonably have provided against before entering into the Contract,</li> <li>(c) which, having arisen, such Party could not reasonably have avoided or overcome, and</li> <li>(d) which is not substantially attributable to the other Party.</li> </ul> <p>Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:</p> <ul style="list-style-type: none"> <li>(i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,</li> <li>(ii) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,</li> </ul>

	<p>(iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel, or Lockdown by Local government</p> <p>(iv) munitions of war, explosive materials, ionising radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and</p> <p>(v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.</p> <p>(vi) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventive precautions like epidemic/ pandemic, unprecedented and unpredictable adverse natural conditions.</p>
<b>19.2 Notice of Force Majeure</b>	<p>If a Party is or will be prevented from performing its substantial obligations under the Contract by <b>Force Majeure</b>, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given <b>within 14 days</b> after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.</p> <p>The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.</p> <p><b>Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.</b></p>
<b>19.3 Duty to Minimise Delay</b>	<p>Each Party shall at all times use all reasonable endeavours to minimise any delay in the performance of the Contract as a result of Force Majeure.</p> <p>A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.</p>
<b>19.4 Consequences of Force Majeure</b>	<p>If the Contractor is prevented from performing his substantial obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], and suffers delay and /or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:</p>

	<p>(a) an extension of time for any such delay, if completion is or will be delayed, under <b>Sub-Clause 8.4 [Extension of Time for Completion]</b>, and</p> <p>(b) if the event or circumstance is of the kind described in Sub-Clause 19.1 [Definition of Force Majeure] occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment].</p> <p>After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.</p>
<b>19.5 Force Majeure Affecting Sub Contractor</b>	<p>If any Sub Contractor is entitled under any Contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.</p>
<b>19.6 Optional Termination, Payment and Release</b>	<p>If the execution of substantially all the Works in progress is <b>prevented for a continuous period of 84 days</b> by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], <b>or for multiple periods which total more than 140 days</b> due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment].</p> <p>Upon such termination, the Engineer shall determine [As per provision of Sub-clause 3.5 Determination] the value of the work done and issue a Payment Certificate which shall include:</p> <p>(a) the amounts payable for any work carried out for which a price is stated in the Contract;</p> <p>(b) the Cost of Plant and Materials (If specifically provided in Contract to supply under the respective BOO) ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employer's disposal;</p>

	<p>(c) other Cost or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;</p> <p>(d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and the return of these items to the Contractor's works in his country (or to any other destination at no greater cost); and</p> <p>(e) the Cost of repatriation of the Contractor's staff and labour employed wholly in connection with the Works at the date of termination.</p>
<b>19.7 Release from Performance</b>	<p>Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (<b>including, but not limited to, Force Majeure</b>) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:</p> <p>(a) the Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and</p> <p>(b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [Optional Termination, Payment and Release] if the Contract had been terminated under Sub-Clause 19.6.</p>
<b>20. Claims, Disputes and Arbitration</b>	
<b>20.1 Contractor's Claims</b>	<p>If the Contractor considers himself to be entitled to any extension of the Time for Completion and /or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer, describing the event or circumstance giving rise to the claim.</p> <p>The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware, or should have become aware, of the event or circumstance.</p> <p>If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended as well as the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the</p>

	<p>claim. Otherwise, the following provisions of this Sub-Clause shall apply.</p> <p>The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.</p> <p>The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.</p> <p><b>Within 42 days</b> after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:</p> <ul style="list-style-type: none"> <li>(a) this fully detailed claim shall be considered as interim;</li> <li>(b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and</li> <li>(c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.</li> </ul> <p>Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.</p> <p>Within the above defined period of 42 days, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4</p>
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	<p>[Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.</p> <p>Each Payment Certificate shall include such <b>additional payment for any claim as has been reasonably substantiated as due under the relevant provision of the Contract</b>. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.</p> <p>To Determine &amp; settle such claims following methods in the order precedence shall be followed.</p> <ul style="list-style-type: none"> <li>i. Negotiation</li> <li>ii. Dispute Board</li> <li>iii. Amicable Settlement / Conciliation</li> <li>iv. Arbitration</li> </ul>
<b>20.2. Negotiation</b>	<p>Upon receipt of Contractor's Claim under the Contract, the engineer shall examine the proposal of claims of the Contractor, ensuring whether it is admissible under provision of Contract and substantiated by sufficient document/ records and information.</p> <p>After examination the Engineer shall record his factual observation and explain the Contractor about the merit of Claim.</p> <p>If claim is admissible the amount of claim shall be discussed with Contractor and effort shall be made to agree the amount of claim by negotiation.</p>
<b>20.3 Appointment of the Dispute Board</b>	<p>If the attempt of Negotiation fails and Engineer or Contractor does not respond within 21 days from the date of negotiation, either Party may consider that the claim is rejected by the Engineer and any of the Parties may refer to the <b>Dispute Board in accordance with detail procedure attached as Annexure-IX-A of Particular Condition</b></p> <p>The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim.</p> <p>Disputes shall be referred to a Dispute Board (DB) for decision in accordance with Sub-Clause 20.5 [Obtaining Dispute Board's Decision]. The Parties shall appoint a DB by the date stated in the <b>Particular Conditions</b>.</p> <p>The DB shall comprise, as stated in the <b>Particular Conditions</b>, either one or three suitably qualified persons ("the members"), each of whom shall be fluent in the language for communication defined in the Contract and shall be a professional experienced in the type of construction involved in the Works and with the interpretation of</p>



	<p>contractual documents. If the number is not so stated and the Parties do not agree otherwise, the DB shall comprise three persons.</p> <p>If the Parties have not jointly appointed the DB before the date stated in the <b>Particular Conditions</b> and if the DB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The first two selected members by parties shall recommend a third member and the Parties shall agree upon the third member, who shall act as chairman.</p> <p>However, if a list of potential members has been agreed by the Parties and is included in the Contract, the members shall be selected from those on the list.</p> <p>The agreement between the Parties and either the sole member or each of the three members shall incorporate by reference the <b>General Conditions of Dispute Board Agreement</b> contained in the <b>Annexure-IX-A of Particular Conditions</b>, with such amendments as agreed between them.</p> <p>The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.</p> <p>If at any time the Parties so agree, they may jointly refer a matter to the DB for it to give its opinion. Neither Party shall consult the DB on any matter without the agreement of the other Party.</p> <p>If a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.</p> <p>The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DB (including each member) shall expire when the discharge referred to in Sub-Clause 14.12 [Discharge] shall have become effective.</p>
<b>20.4 Failure to Agree on the Composition of the Dispute Board</b>	<p>If any of the following conditions apply, namely:</p> <p>(a) the Parties fail to agree upon the appointment of the sole member of the DB by the date stated in the first paragraph of Sub-Clause 20.3, [Appointment of the Dispute Board],</p>

	<p>(b) either Party fails to nominate a member (for approval by the other Party), or fails to approve a member nominated by the other Party, of a DB of three persons by such date,</p> <p>(c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DB by such date, or</p> <p>(d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,</p> <p>then the appointing entity or official named in the <b>Particular Condition s</b> shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.</p>
<b>20.5 Obtaining Dispute Board's Decision</b>	<p>If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer, either Party may refer the dispute in writing to the DB for its decision, with copies to the other Party and the Engineer. Such reference shall state that it is given under this Sub-Clause.</p> <p>For a DB of three persons, the DB shall be deemed to have received such reference on the date when it is received by the chairman of the DB.</p> <p>Both Parties shall promptly make available to the DB all such additional information, further access to the Site, and appropriate facilities, as the DB may require for the purposes of making a decision on such dispute. The DB shall be deemed to be not acting as arbitrator(s).</p> <p>Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision, which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue to proceed with the Works in accordance with the Contract.</p> <p>If either Party is dissatisfied with the DB's decision, then either Party may, within 28 days after receiving the decision, give a Notice of</p>

	<p>Dissatisfaction to the other Party indicating its dissatisfaction and intention to commence arbitration. If the DB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give a Notice of Dissatisfaction to the other Party.</p> <p>In either event, this Notice of Dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in Sub-Clause 20.7 [Failure to Comply with Dispute Board's Decision] and Sub-Clause 20.8 [Expiry of Dispute Board's Appointment], neither Party shall be entitled to commence arbitration of a dispute unless a Notice of Dissatisfaction has been given in accordance with this Sub-Clause.</p> <p>If the DB has given its decision as to a matter in dispute to both Parties, and no Notice of Dissatisfaction has been given by either Party within 28 days after it received the DB's decision, then the decision shall become final and binding upon both Parties.</p>
<b>20.6 Failure to Comply with Dispute Board's Decision</b>	<p>In the event that a Party fails to comply with a final and binding DB decision, then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under Sub-Clause 20.9 [Arbitration]. Sub-Clause 20.5 [Obtaining Dispute Board's Decision] and Sub-Clause 20.6 [Amicable Settlement] shall not apply to this reference.</p>
<b>20.7 Expiry of Dispute Board's Appointment</b>	<p>If a dispute arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works and there is no DB in place, whether by reason of the expiry of the DB's appointment or otherwise:</p> <p>(a) Sub-Clause 20.5 [Obtaining Dispute Board's Decision] and Sub-Clause 20.6 [Amicable Settlement] shall not apply, and</p> <p>(b) the dispute may be referred directly to arbitration under Sub-Clause 20.9 [Arbitration].</p>
<b>20.8 Amicable Settlement / Conciliation</b>	<p>Where a Notice of Dissatisfaction has been given under Sub-Clause 20.5 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a Notice of Dissatisfaction in accordance with Sub-Clause 20.5 above should move to commence arbitration after the <b>fifty-sixth day</b> from the day on which a Notice of Dissatisfaction was given, even if no attempt at an amicable settlement has been made.</p>
<b>20.9 Arbitration</b>	<p>Any dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 20.6 above and in respect of which the DB's decision (if any) has not</p>

	<p>become final and binding shall be finally settled by arbitration. Arbitration shall be conducted as follows:</p> <p>(a) if the contract is with foreign Contractors,</p> <p>(i) for contracts financed by all participating Banks except under subparagraph (a) (2) below: international arbitration (1) with proceedings administered by the arbitration institution designated in the <b>Particular Condition s</b>, and conducted under the rules of arbitration of such institution; or, if so specified in the <b>Particular Condition s</b>, (2) international arbitration in accordance with the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL); or (3) if neither an arbitration institution nor UNCITRAL arbitration rules are specified in the <b>Particular Condition s</b>, with proceedings administered by the International Chamber of Commerce (ICC) and conducted under the ICC Rules of Arbitration; by one or more arbitrators appointed in accordance with said arbitration rules</p> <p>(b) if the Contract is with domestic Contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's country.</p> <p>(c) Matters to be arbitrated upon shall be referred to a sole Arbitrator if the total value of the claim is up to Rs.5 million and to a panel of three Arbitrators if total value of claims is more than Rs.5 million. The Employer shall provide a panel of three arbitrators which may also include Employers officers for the claims up to Rs.5 million and a panel of five Arbitrators which may also include Employer officers for claims of more than Rs.5 million. The Contractor shall have to choose the sole Arbitrator from the panel of three and/or one Arbitrator from the panel of five in case three Arbitrators are to be appointed. The Employer shall also choose one Arbitrator from this panel of five and the two so chosen will choose the third arbitrator from the panel only. The Arbitrator(s) shall be appointed within a period of 30 days from the date of receipt of written notice/ demand of appointment of Arbitrator from either party. Neither party shall be limited in the proceedings before such arbitrator(s) to the evidence nor did arguments put before the Engineer for the purpose of obtaining his decision. No decision given by the Engineer in accordance with the foregoing provisions shall disqualify him from being called as a witness &amp; giving evidence before the arbitrator(s) on any matter, whatsoever, relevant to dispute or difference referred to arbitrator/s. The arbitration proceedings shall be held in</p>
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	<p>Pune only. The language of proceedings that of documents and communication shall be English.</p> <p>(d) The Employer at the time of offering the panel of Arbitrator(s) to be appointed as Arbitrator shall also supply the information with regard to the qualifications of the said Arbitrator nominated in the panel along with their professional experience, phone nos. and addresses to the contractor.</p> <p>(e) The award of the sole Arbitrator or the award by majority of three Arbitrators as the case may be shall be binding on all parties. The award shall be made claim wise and will be a speaking award.</p> <p>The place of arbitration shall be the neutral location specified in the <b>Particular Condition s</b>; and the arbitration shall be conducted in the language for communications defined in Sub-Clause 1.4 [Law and Language].</p> <p>The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the DB, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.</p> <p>Neither Party shall be limited in the proceedings before the arbitrators to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration.</p> <p>Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Engineer and the DB shall not be altered by reason of any arbitration being conducted during the progress of the Works.</p>
<b>20.10 Sub-Clause Arbitration Fees</b>	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.
<b>20.11 Sub-Clause Jurisdiction of Courts</b>	Where recourse to a Court is to be made in respect of any matter, the jurisdiction of court shall be: High Court of Judicature at Bombay - Bombay Bench.
<b>20.12 Sub-Clause Suspension of Work on</b>	The reference to Conciliation / Arbitration shall proceed notwithstanding 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

<b>Account of Arbitration</b>	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.
<b>20.13 Sub-Clause Notice of Contractor</b>	<p>a. All notices to the Contractor, shall be served by post or telex or telefax IE-Mail/Registered Post on address of communication provided in bid or further local address for communication by hand to the Contractor or his authorized representatives. In case of notices delivered by post, they will be deemed to have been delivered after 7 days of dispatch.</p> <p>b. The Contractor shall, on award of the Contract, furnish to the Engineer, the name, designation, address and telephone, telex and telefax numbers and e-mail address of his representative referred above.</p>
<b>20.14 Sub-Clause Notice to Employer &amp; Engineer</b>	All Notices to the Employer or Engineer shall be served by post or telex or telefax IE-Mail/Registered Post on address of communication provided in bid or any change thereafter or by delivering by hand to the address nominated for the purpose.
<b>20.15 Sub-Clause Change of address</b>	Parties to the contract may change the nominated address by employer with a notice to all concerned.

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(CRF WORKS)****BID DOCUMENTS**  
**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

TENDER NO. P1Misc-32/2024

Part-III: Conditions of Contract and Contract Forms  
Section -IX: Particular Conditions of Contract (PC)**Maharashtra Metro Rail Corporation Limited**Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIAE-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)

**Particular Conditions of Contract**

The following Particular Conditions shall supplement the GC. Whenever there is a conflict, the provisions herein shall prevail over those in the GC.

S.No	Name	GCC Sub Clause No.	Description
1	Employer's name and address	1.1.2.2 & 1.3	<b>MAHARAHSTRA METRO RAIL CORPORATION LIMITED (Pune Metro Rail Project)</b> Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005. <b>E-mail id:</b> <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a> <b>Website:</b> <a href="http://www.punemetrorail.org">www.punemetrorail.org</a> e-tender portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a>
2	Engineer's name and address	1.1.2.4 & 1.3	<i>(to be nominated by employer after award of work)</i>
3	Bank's name	1.1.2.11	Equity
4	Borrower's name	1.1.2.12	-
5	Time for Completion	1.1.3.3 & 8.2	<b>24 Months</b> from the date of issue of LOA
6	Defects Notification Period (Defect Liability Period)	1.1.3.7	<b>12 Months (Twelve Months)</b>
7	Sections	1.1.5.6	<b>Deleted</b>
8	Country	1.1.6.2	India
9	Site	1.1.6.7	Pune Metro Rail Project
10	Climatic Conditions	1.1.6.11	"Climatic Conditions" is defined as follows: Environmental Exposure condition: Earthquake Seismic Zone 11
11	Cost Plus Profit	1.2 (g)	<i>(Not applicable)</i>
12	Electronic transmission	1.3 (a)	Electronic transmission shall be in the form of scanned copy of original documents, Letters, Mail, Post communicated through authorized E-Mail IDs of Parties or uploaded appropriately at E-Tender portal of Maharashtra Govt. (as the case may be)



13	Address for the recipient's communication	1.3(b)	<b>MAHARAHSTRA METRO RAIL CORPORATION LIMITED (Pune Metro Rail Project)</b> Civil Court Metro Station, Nyayamurti Ranade Path, Pune-411005. <b>E-mail id:</b> <a href="mailto:tenders.pmrp@mahametro.org">tenders.pmrp@mahametro.org</a> <b>Website:</b> <a href="http://www.punemetrorail.org">www.punemetrorail.org</a> e-tender portal <a href="https://mahatenders.gov.in">https://mahatenders.gov.in</a>
14	Governing Law	1.4	Acts and Laws of India
15	Ruling language	1.4	English
16	Language for communications	1.4	English
17	Time for entering in Contract Agreement and relevant forms	1.6	Time for entering in Contract shall be not more than 28 Days from date of issue of LOA Relevant forms are given in <b>Contract Form Section</b> of Bid Document
18	Delayed Drawings or Instructions	1.9(a)	Deleted
19	Applicable Law	1.13	Acts and Laws of India
20	Engineer's Duties and Authority	3.1	The Engineer shall manage, monitor & implement the Contract Agreement on behalf of Employer and obtain the specific approval of the Employer regarding all contractual, technical & financial matters associated with work as & when required. The Engineer shall be nominated by Employer after award of work to contractor.
21	Procedure of variation	3.1 (b) (ii)	Provided in subsequent paras below
22	Part of work to be designed by contractor	4.1	As described in Work Requirement & Financial Bid

23	Performance Security	4.2	<p><b><u>In addition to existing Sub -Clause 4.2 of GCC</u></b></p> <p>The performance security will be in the form of <b>Bank guarantee of the amount(s) at 10% (Ten percent)</b> of the Accepted Contract Price drawn in favour of Maharashtra Metro Rail Corporation Limited and in the same currency (ies) of the Accepted Contract Price, issued from scheduled commercial bank of Indian or Foreign origin (Except Cooperative Bank) having business office in India. (Latest guidelines issued by GOI in this regard shall be applicable)</p> <p>Once The variation approved under Cl. 13.3 (GCC/PCC) exceeds beyond 25% of the Contract Price, contractor shall submit the additional Performance Security to cover entire amount of approved variation at the rate stated above.</p>
24	(Additional sub-clause)  Parent Company Guarantees/ Warranties and Undertakings	4.2 (a)	<p>(Applicable if Contractor is Subsidiary &amp; bidding on behalf of a Parent Company using credential of a Parent Company, which has been specifically permitted by Employer)</p> <p>Within 30 days of the date of Letter of Acceptance of the Bid, the Contractor shall submit to the Employer:</p> <p>(a) An Undertaking in the approved format from a parent company, the identity of which shall have been submitted in writing to the Employer prior to acceptance of the Bid and against which the Employer shall have raised no-objection.</p> <p>(b) A written Guarantee in the approved format from a parent company, the identity of which shall have been submitted in writing to the Employer prior to acceptance of the Bid and against which the Employer shall have raised no objection.</p> <p>(c) A warrantee in the approved format from the Contractor.</p>
			<p>In the event that the Contractor shall comprise two or more members, corporations acting in partnership, joint venture, consortium or otherwise each such member or corporation shall submit a parent company Undertaking and Guarantee.</p> <p>The forms of Contractor warranty shall be in the format given in the <a href="#">Section X: Contract Forms</a>.</p>

25	(Additional sub-clause)  Failure to submission of Performance Guarantee, Parent Company/ Guarantees, Warranties and Undertakings	4.2 (b)	Notwithstanding any other provision of the Contract:  (a) submission by the Contractor of the requisite Performance security, parent company Undertakings and written parent company Guarantees / warrantees shall be condition precedent to the Contractor's entitlement to any payment, under the Contract; and  (b) failure by the Contractor to provide a Performance security or parent company Undertakings or parent company Guarantees / warrantees shall entitle the Employer either to suspend the Works or to terminate the Contract forthwith by notice in writing to that effect, notwithstanding that the Contractor may have been to proceed with the Works, and the Contractor shall not be compensation whatsoever as a consequence of such suspension or termination
26	Subcontractors	4.4	Refer Form-13 of Section- X
27	Progress reports	4.21	In addition to Monthly progress report, employer may ask weekly progress report.
28	Normal working hours	6.5	Normal working hours are 8.00 Hrs. to 17 Hrs. The Contractor, if required, shall carry out work during night hours or in shifts. The Contractor shall not be entitled to any claim in addition to the Accepted Contract Price on account of night/shift working.
28. a	Testing	7.4	In addition to the provisions in the GCC:  Wherever, Maha-Metro has in-house testing facility, all testing has to be done in the said facility. In case any specific testing is not possible, the tests are to be done from a laboratory approved by Employer.
29	Commencement of Works	8.1	The Commencement Date shall be:  <b>Date given in LOA</b>
30	Delay damages for the Works	8.7	The penalty for delay in work, beyond mentioned completion date/ duration, shall be 0.1% of the contract value per week of delay or part thereof. The maximum value of penalty shall be 10% of the contract amount.
31	Maximum amount of delay damages	8.7	10 % of the Contract Price.
32	Consequences	8.9	<b>Add to Sub Clause 8.9:</b>

	of Suspension		<p>The Contractor shall not be entitled to extra cost (if any), other than provided below incurred by him, except as stated below during the period of suspension of work, if such suspension is:</p> <p>a. Provided for in the Contract, or</p> <p>b. necessary for proper execution of works or by reasons of weather condition or by some default on the part of the Contractor, or</p> <p>c. necessary for the safety of Works or any part thereof or</p> <p>d. necessary for the safety of adjoining public or other property or safety of the public or workmen or those who have to be at the site or</p> <p>e. to ensure safety and to avoid disruption of traffic and utilities, as also to permit fast repairs and restoration of any damaged utilities.</p>																														
			<table><tr><th>Sr. No</th><th>Suspension Period</th><th>Extension of Time</th><th>Compensation for the suspension period</th><th>Remarks</th></tr><tr><td></td><td>Up to 14 days</td><td>No</td><td>No</td><td>Engineer may give extension of time in exceptional circumstances</td></tr><tr><td></td><td>15-30 days</td><td>yes</td><td>No</td><td>extension of time as considered proper by the Engineer</td></tr><tr><td></td><td>Above 30 days</td><td>Yes</td><td><ul style="list-style-type: none"><li>As per Daily rate of wages for idle labour/ employees.</li><li>70% of the rate for hire charges for idle plant and machinery (excluding cost of fuel and lubricants)</li><li>15% above all these items to Cover Overhead costs</li></ul></td><td>Compensation as assessed by the Engineer on submission of documentary proof by the contractor to engineer's satisfaction</td></tr><tr><td></td><td>Above 90 days</td><td>No</td><td>As per Clause no 13.3.4</td><td>Contractor may ask for closure of the contract, or</td></tr><tr><td></td><td></td><td></td><td></td><td>deletion from the Contract of that part of works which has been suspended</td></tr></table>	Sr. No	Suspension Period	Extension of Time	Compensation for the suspension period	Remarks		Up to 14 days	No	No	Engineer may give extension of time in exceptional circumstances		15-30 days	yes	No	extension of time as considered proper by the Engineer		Above 30 days	Yes	<ul style="list-style-type: none"><li>As per Daily rate of wages for idle labour/ employees.</li><li>70% of the rate for hire charges for idle plant and machinery (excluding cost of fuel and lubricants)</li><li>15% above all these items to Cover Overhead costs</li></ul>	Compensation as assessed by the Engineer on submission of documentary proof by the contractor to engineer's satisfaction		Above 90 days	No	As per Clause no 13.3.4	Contractor may ask for closure of the contract, or					deletion from the Contract of that part of works which has been suspended
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				deletion from the Contract of that part of works which has been suspended																													

33	Defect Liability	11.1U)	A penalty of Rs.10,000/- per day in OLP period, will be imposed if Defect / complaint is not attended and complied within the time specified in the notice for rectification of the defect.
34	Variation Procedure	13.3	<p><b>Variation Procedure</b></p> <p><b><u>In further addition to existing Sub -Clause 13.3 of GCC</u></b></p> <p>"Employer's Variation" means a change in the Works Requirements which makes necessary alteration or modification of the Design, quality or scope of Works as described by or referred to in the Works Requirements. Changes to any sequence, method or timing of manufacture, testing and Commissioning including Integrated Testing and Commissioning and changes to any part of the Site or access thereto will not constitute Employer's Variation.</p> <p>An Employer's Variation shall be requested and implemented in accordance with and subject to the following provisions:</p> <p>within 14 days (or such other period as the Engineer may allow) of the Engineer informing the Contractor in writing of the intention to request an Employer's Variation, the Contractor shall notify the Engineer in writing whether in his opinion the Employer's Variation would, if ordered:</p> <ul style="list-style-type: none"> <li>(i) give rise to any entitlement to an extension of time; or</li> <li>(ii) affect the achievement of any Milestone; or</li> <li>(iii) give rise to any entitlement to additional payment; or</li> <li>(iv) affect the warranties of the Contractor set out in Conditions of Contract,</li> </ul> <p>and shall submit his proposals as to the terms upon which he would agree to implement the Employer's Variation.</p> <p>The Engineer shall, as soon as practicable after receipt of proposals under sub-clauses 13.2 and / or 13.3, respond with approval, rejection or comments. If the Engineer instructs or approves a Variation, he shall proceed in accordance with Sub-Clause 3.5 to agree or</p>

			<p>determine adjustments to the Contract Price, Time for Completion and Schedule of Payments. After receipt of proposal, it will be the prerogative of the Employer, whether to Instruct and proceed ahead with the variation or drop the proposal in part or full. In that case, no cost of preparing and submitting the proposal will be payable to Contractor. In case, the design part of variation has been completed on submission of same to the Engineer, the Employer decides to abandon the variation, only cost for design to the extent of work done will be paid to the Contractor.</p> <p><b>Until such time an appropriate rate or price is agreed or determined, the Engineer shall determine a provisional rate or price for the purposes of Interim Payment Certificates as soon as the concerned work commences.</b></p> <p><b><u>Detail Procedure for Variation in Quantities &amp; Work</u></b></p> <p><b><u>1. Variation of Quantities in Existing BOQ items under the Contract</u></b></p> <p>The quantities of items shown in the Bill of Quantities are approximate, and liable to vary during the actual execution of the work. Some items /group of items may have to be altered, added or omitted. The Contractor shall be bound to carry out and complete the stipulated work as instructed by the Engineer, irrespective of the magnitude of variations including additions, alterations or omissions in the Bill of Quantities, individual items or Group of Items, specified in the Bill of Quantities.</p> <p>1. At the accepted rates of the Contract for Positive variation in quantities to the extent of 25%, except in the case of foundation works. Unless otherwise specifically provided for in the Bill of Quantities or elsewhere in the Contract, the variation of 25% shall be applicable to a group of items (Each schedule as a whole shall be treated as a Group Of Items) mentioned therein and not to individual items. In case of variation in quantities on minus side, contract rates will be payable for executed quantities.</p> <p>11. In case of foundation work, no variation limit applies and Contractor shall carryout the</p>
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			<p>Work, at rates stipulated in the Contract irrespective of any variation.</p> <p>111. In case of earth work, the aforesaid variation limit of 25% shall apply to the gross quantity of earth work and variation in the quantity of individual classifications of soil will not be subject to this limit where any variation can take place.</p> <p>1v. For items against which the quantity given in the Bills of Quantities is "if or as required", there shall be no increase/decrease of rates whatever be the quantity finally executed.</p> <p>v. Variation in the quantity of items individually costing up to 1% of the total contract value, shall be payable at the rates stated in the Contract notwithstanding the magnitude of variation up to 2% of the original Contract Value for each item.</p> <p>v1. In case the variation in the group of items (except the case describe in 1.(v) above), is more than 25% on positive side, the rate for the varied quantity of individual items of that particular group varying beyond 25% shall be negotiated between the Engineer and the Contractor and mutually agreed rates arrived at before actual execution of the extra quantity.</p> <p>2. <b><u>Variation due to New Items /NS Items</u></b></p> <p>In all cases where new items of work are involved, for which there are no rates in the accepted Bill of Quantities the Contractor shall give a notice to the Engineer, at least 14 days before the need for their execution arises.</p> <p>1. If Employer/ Engineer finds that any extra items / NS Item, which is not included in the BOQ Schedules of this contract and is required to be executed, it may be done at:</p> <p>a. <b>Latest Schedule of Rate of CPWD - DSR</b> with applicable guidelines and circular / amendments /correction / latest revision / latest publication at the time of execution of the work <b>or</b></p> <p>b. <b>Latest Schedule of Rate of Maharashtra PWD / MJP</b> with applicable guidelines and circular / amendments /correction / latest revision / latest publication at the time of execution of the work <b>or</b></p> <p>c. rate for similar items available in Bill of Quantities of the accepted tenders duly</p>
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			<p>updated to current price level at 5% Simple interest per year <b>(in the above sequence).</b></p> <p>d. No Price Variation shall be applicable on rates of Items derived under "a" or "b" above. Whereas, rates derived under "c" above shall be fixed for the period of 18 months from the issue of Variation Order and shall be reviewed for further period if required.,.</p> <p>11. <b>In case, the above is not possible, following steps are to be followed to arrive rates of such items</b></p> <p>a. Cost of Materials at current market price, as actually utilised in the final finished Permanent Works, including a reasonable percentage for wastage and transportation.</p> <p>b. Cost of enabling works if any (unless provided for separately) worked out on the above basis but with less stringent quality. Specifications minus salvage value of serviceable material released after completion of work and cost of material released as scrap.</p> <p>c. Cost of labour actually used at the site of work at rates under Payment of Minimum Wages Act for the area of work for each category of worker, further enhanced by a percentage of 10% of the aforesaid rates to account for labour not directly utilised at Site and other ancillary and incidental expenses on labour.</p> <p>d. Hire charges for Plant &amp; Machinery, scaffolding, shuttering, forms, etc. required to be used at the site of the work. The tools used by the various trades shall not be counted as Plant &amp; Machinery for this purpose.</p> <p>e. An amount of 20% of items (i), (ii), (iii) and (iv) above is added as Contractor's overheads, profits and corporate taxes. This percentage shall also apply to estimated cost of Materials supplied free of cost to the Contractor.</p> <p>f. If the said Extra Items /NS Item are executed / supplied by a sub-contractor/ sub agencies complete in all respect on behalf of the Contractor then an amount of 8% shall be added to the billed rate /amount of Sub-Contractor / supplier/ sub-agencies and paid to Contractor under a Sub Contract agreement with Contractor.</p>
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			<p>3 (i) In the event of disagreement in respect of determination of rate, the Engineer shall fix such rates or prices as are, in his opinion appropriate and shall notify the Contractor accordingly, with a copy to the Employer. Until such time as rates or prices are agreed or fixed, the Engineer shall determine provisional rates or prices to enable on account payments to the Contractor. Alternatively, in the event of disagreement, the Contractor shall have no claim to execute extra quantities /new items/NS Items and the Engineer shall be free to get such additional quantities beyond 25% and new items / NS Items executed through any other agency appointed by Employer. However, if the Engineer or the Employer so directs, the Contractor shall be bound to carry out any such additional quantities beyond the limits stated above original quantities and or new items / NS Items and the disagreement or the difference regarding rates to be paid for the same shall be settled in the manner laid down under the conditions for the settlement of dispute.</p> <p>3(ii) The Contractor shall furnish sufficient information in terms of rates /prices of the works, equipment /components manufactured by the contractor or sourced from the Vendors/Sub-contractors such as: estimated man-hours, man-hours rates for manufactured items, design costs, basic rate of materials, sub-assemblies, taxes, duties, overheads &amp; profits and inflation rate, so as to establish the reasonableness of the variation price. In assessing work covered by any sub-contract, the Engineer shall have, where he deems necessary, access to the original sub-contract conditions, rates, prices and details of the variation claimed and may direct the Contractor to provide a copy of the same, to assist in evaluating any Variations.</p> <p>3(iii) Any agreement between the Engineer and the Contractor as to the terms upon which an Employer's Variation may be implemented shall have no contractual or other legal effect, until it is in writing and is signed by the Contractor and the Engineer. The Engineer before signing such agreement shall take prior approval of the</p>
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			<p>Employer. The terms of this agreement will be binding upon the Contractor and the Employer. This agreement shall determine the amount which should be added to or deducted from the relevant Cost Centre Amount and/or the revisions (if any) which should be made to the Milestone Payment Schedules as a result of the Variation.</p> <p>3(iv) In the event of the Engineer and the Contractor failing to reach agreement on the revisions to be made to the Cost Centre Amounts, the Engineer shall, with the approval of the Employer, determine the amount which should be added or deducted from the relevant cost centre amount which shall be binding on the contractor. In case the Contractor supplies part/ incomplete information or refuses to supply the required information, Engineer shall determine the cost of Variation based on the information available to him from any sources which in his judgment can be used to determine the case. The Contractor shall proceed with the Work irrespective of whether an agreement between the Engineer and Contractor as to the terms and price of the variation have been reached or not but may submit his Claim if necessary, in accordance with Sub-clause 20 of GCC.</p> <p>3(v) If the Engineer withdraws the request for an Employer's Variation, the Contractor shall have no claim of any kind whatsoever arising out of or in connection with any of the proposals made or any failure to reach agreement. In case the Employer's Variation involves omission of part of the Works, the agreement shall address the issue of reduction in the Contract Price.</p>
35	<b>Provisional Sums (Overhead &amp; Profit)</b>	<b>13.5.(b)(ii)</b>	<p>i. An amount of 20% of items under sub clause 13.3.2(ii) (a), (b), (c) and (d) above is added as a Contractor's overheads, profits and corporate taxes. This percentage shall also apply to estimated cost of Materials supplied free of cost to the Contractor.</p> <p>ii. If the said Extra Items /NS Item are executed / supplied by a sub-contractor / sub agencies complete in all respect on behalf of the Contractor</p>

			then an amount of 8% shall be added to the billed rate /amount of Sub-Contractor / supplier/ sub-agencies and paid to Contractor under a Sub Contract agreement with Contractor.
36	Base Date	13.7	28 <sup>th</sup> Day prior to last date of submission of bid
37	Adjustments for Changes in Cost  {this clause is not applicable to this tender}	13.8	<p>In continuation to the provisions in GCC, following Procedure shall be adopted to determine the adjustment for change in Cost</p> <p>a) The rates as per the accepted Bill of Quantities / Pricing Document shall be applicable till the completion of the Works and will be varied only to the extent of permissible price variation under this clause, <b>which will be applicable for the Schedules mentioned above from date of commencement of this contract.</b> However, this adjustment shall be to the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the Price Variation formula, the rates in the accepted Bill of Quantities / Pricing Document shall be deemed to include amounts to cover the contingency of such rise or fall in costs. The price variation will be payable only on the Indian currency component (no adjustment for foreign currency component) of the Contract Price as per the following price variation formula. <i>(it is clarified that, Price Adjustment calculated under this clause shall be paid only against the works executed after original completion period and only if the Extension of Time is approved by Maha-Metro for the reasons attributable to Maha-Metro)</i></p> <p>b) Payment as per the Contract shall be subject to adjustment in accordance with the following Price Variation formula, and other terms given herein, to provide for variation in the market rates of inputs like labour, materials and fuel / energy during the currency of the Contract:</p> $V = VL + V_5 + V_e + VF + V_M$

Where:		
V	Total adjustment on account of all components / factors	
	Adjustment on account of labour component $= p * R * \frac{l - l_o}{l_o}$	
	Adjustment on account of steel Component $= q * R * \frac{W_s - W_{so}}{W_{so}}$	
	Adjustment on account of cement Component $= r * R * \frac{W_c - W_{co}}{W_{co}}$	
	Adjustment on account of fuel / lubricant component $= s * R * \frac{Wr - W_{ro}}{W_{ro}}$	
	Adjustment on account of other materials, machinery and machine tools Component $= t * R * \frac{W_m - W_{m1}}{W_{m1}}$	
p	Cost coefficient of labour to the total Cost = 0.20	
q	Cost coefficient of Steel to the total cost = 0.25	
r	Cost coefficient of Cement to the total Cost = 0.17	
s	Cost coefficient of Fuel & Lubricants to the total cost = 0.05	
t	Cost coefficient of other Materials, machineries, tools and plants. = 0.18	

			<b>Note:</b> $p + q + r + s + t = 0.85$ , balance 0.15 shall be the fixed component	
			$R$	Gross value of the work done by the Contractor for the period of work under consideration, after excluding the cost of any materials supplied free or at fixed rate to the Contractor.
				Consumer Price Index for Industrial workers (with Base 2016=100), published in the bulletin Labour Bureau of India, as applicable to place / region of work from the base date.
				Average of monthly Consumer Price Index for Industrial workers (with Base 2016=100), published in Labour Bureau of India, as applicable to place / region from the base date.
			$vI7s_0$	All India Price Index (with base Oct'2012 = 100) for Reinforcement Bars TMT Fe 500D, issued by CPWD for the month in which the Original Completion period gets over.
			$vI1s$	All India Price Index (Average) (with base Oct'2012 = 100) for Reinforcement Bars TMT Fe 500D, issued by CPWD for the period of work under consideration.  This shall be applicable for all types, all grades and all diameters of reinforcement steel. These indices issued for Delhi shall be applicable for all works of PMRP
			$Wea$	Wholesale Price Index (with base 2011-12 = 100) for Cement, Lime and Plaster issued by Reserve Bank of India for the month in which the Original Completion period gets over.
			$We$	Wholesale Price Index (Average) (with base 2011-12 = 100) for Cement, Lime and Plaster issued by Reserve Bank of India for the period of work under Consideration
			$W_{10}$	Whole Sale Price Index for Fuel & Power (with base 2011-12 = 100), as published in the RBI Bulletin for the

			<table border="1"> <tr> <td></td> <td>month in which the Original Completion period gets over.</td> </tr> <tr> <td><math>w_I</math></td> <td>Whole sale Price Index (Average) for Fuel &amp; Power, (with base 2011-12 = 100) as published in the RBI Bulletins for the period of work under consideration</td> </tr> <tr> <td><math>W_{ma}</math></td> <td>Whole Sale Price Index for Machinery for Mining, Quarrying and construction (with base 2011-12 = 100) as published in the RBI Bulletin, for the month in which the Original Completion period gets over.</td> </tr> <tr> <td><math>W_m</math></td> <td>Wholesale Price Index (Averages) for Machinery for Mining, Quarrying and construction (with base 2011-12 = 100) as published in the RBI Bulletin for the period of work under consideration</td> </tr> </table>		month in which the Original Completion period gets over.	$w_I$	Whole sale Price Index (Average) for Fuel & Power, (with base 2011-12 = 100) as published in the RBI Bulletins for the period of work under consideration	$W_{ma}$	Whole Sale Price Index for Machinery for Mining, Quarrying and construction (with base 2011-12 = 100) as published in the RBI Bulletin, for the month in which the Original Completion period gets over.	$W_m$	Wholesale Price Index (Averages) for Machinery for Mining, Quarrying and construction (with base 2011-12 = 100) as published in the RBI Bulletin for the period of work under consideration
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$W_m$	Wholesale Price Index (Averages) for Machinery for Mining, Quarrying and construction (with base 2011-12 = 100) as published in the RBI Bulletin for the period of work under consideration										

**c) Period of Work under consideration will mean as under:**

- In the case of first "On-account Bill" the period from the months in which the Bid was opened to the month of measurement of first bill.
- In the case of second and subsequent "On-account" and Final bills, the Period from the month of measurement for previous bill to the month of measurement of that bill.
- Responsibility of arranging the RBI Bulletins as desired by the Employer or the Engineer shall rest with the Contractor.

**d) Procedure in case of delay in Availability of final RBI indices:**

Where the final Price Indices are not available in the Reserve Bank of India Bulletins, while making payment towards on-account bills, payment towards Price Variation will be made on provisional basis based on the indices available, to be adjusted in subsequent bills as and when the final indices figures become available.

**e) Price Variation for Varied Items i.e. extra item / new items/NS Items**

No price variation clause shall be applicable to any extra item / new items/NS Items not originally included in the accepted Bill of Quantities / Pricing

			<p>Document and for which the rates are fixed separately under Clause 13 of GCC.</p> <p><b>f) Adjustment on account of Price Variation:</b></p> <p>Adjustment on account of Price Variations may be positive (in which case extra amount shall be paid to the Contractor), or negative (in which case the amount of Price Variation shall be recovered from the Contractor). Adjustment on account of Price Variation shall be calculated separately, for each period, between two successive dates of measurements for bills and paid along with each bill or separately as claimed by the Contractor.</p> <p>After verifying the bill, the Engineer shall certify the adjustment amount and advise the same to the Employer along with the 'On Account' bill. Should any extra amount be due to Contractor, the Employer shall pay the same as far as possible within 28 days of certification by Engineer. Any amount due from Contractor on account of negative adjustment shall be recovered from his pending or other bills at the earliest.</p> <p><b>g) Price Variation during extended period of completion:</b></p> <p>The price adjustment as worked out above i.e. either increase or decrease will be applicable up to the stipulated date of completion of the work including the extended period of completion where such extension has been granted under Sub-Clause 8.4 &amp; 8.5 of GC or it is specifically mentioned that extension is with price variation also. However, where extension has been granted under Sub-Clause 8.7 of GC, price adjustment will be due as follows:</p> <p>In case the indices increase above the indices applicable to a bill made on the last date of original completion period or the extended period under Sub-Clauses 8.4 &amp; 8.5 of GC, the price adjustment for the period of extension under Sub-Clause 8.7 of GC will be limited to the amount payable as per the indices applicable to a bill made on the last date of the original completion period or the extended period under Sub-Clauses 8.4 &amp; 8.5 of GC as the case may be.</p> <p>In case the indices fall below the indices applicable to a bill made on the last date of the original or</p>
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			extended period of completion, then the lower indices will be adopted for Price Adjustment for the period of extension under Clause 8.4 & 8.5 of GC unless the extension has been granted due to Contractor's fault.
38	The Contract Price	14.1	<p><b><u>Add following to existing clause</u></b></p> <p>(e) The Contractor shall submit the proof of registrations under various fiscal and labour laws (whichever is applicable as per nature of work) like Income Tax, GST, Profession Tax, Central Excise, Import Export Code, Employee State Insurance, Provident Fund, Maharashtra Labour Welfare Fund, Local Body Tax (as the case may be) and shall submit an undertaking that he will get registered with the competent authority/ies for complying with various laws that are applicable.</p> <p>(f) The Contractor shall be solely responsible to find out and ascertain whether their supplies for Maha-Metro will qualify and be eligible for the concession duty benefits under Chapter 98.01 of custom Tariff Act for project Imports &amp; shall manage the Custom Duty and Excise duty applicability and inclusion in their quoted price accordingly. After award of the Contract, Employer at the written request of a contractor shall facilitate the contractor for obtaining sponsoring / recommendation letter from the Ministry of Urban Development (MoUD) / GOM for getting themselves registered for availing Project Import benefits. However, the responsibility to avail the concessional benefits under Project Import or otherwise as extended in accordance with the law of the land shall solely rest with the Contractor.</p> <p>(g) Should the Employer, during execution of the contract, obtain a waiver of any taxes, if applicable, in full or part thereof, the Contractor will be advised on the process to be followed to obtain exemption /refund of such taxes, duties etc., from the concerned Authorities. In case of failure by the Contractor to obtain and remit the refund within reasonable time (to be decided by the Employer &amp; intimated to contractor) to the Employer, the same will be recovered by the Employer from the amounts due as payment to the Contractor or as debt due from the Contractor. The decision of the Employer shall be final and binding. If the Contractor fails to take the required action to obtain refund or</p>



			<p>exemption, the Employer may take action in accordance with condition of Contract.</p> <p>(h) The Contractor shall maintain meticulous record of all the taxes and duties paid to various department in connection to this work and the same required to be submitted as and when required by the Employer.</p> <p>(i) The Contractor also will have to submit 'No Dues Certificate' for the year/ period as and when required by Employer.</p> <p>(ii) The full and final payment to Contractor will be made only after documents as required above are furnished by him and checked by Employer.</p> <p>(i) Customs and Excise:</p> <p>The Contractor shall submit</p> <ol style="list-style-type: none"> <li>Certificate from Chartered Accountant with regards to payment of Customs / Excise Duty with respect to imports / manufacture of materials for Employer</li> <li>Copy of challans in regard to deposit of tax and Import Documents to be furnished along with the bills.</li> <li>Any duty drawback, export / import incentive, concession / exemption available to the Contractor to be passed on to MAHA-METRO.</li> </ol> <p>U) Labour Welfare Fund, ESI, PF and other labour related payments:</p> <ol style="list-style-type: none"> <li>Primary responsibility for payment statutory dues or other dues within stipulated time shall be primary responsibility of the Contractor.</li> <li>Employer at no point of time shall be responsible for the same.</li> <li>Contractors shall certify on annual basis that there are no unpaid dues relating to persons working in Employer's work.</li> <li>Employer has a right to recover any unpaid dues from the Contractor in the event of default at his part.</li> <li>In case of System works where supply of items and execution is separately given in the scope of work, then the labour cess at the prevailing rates (currently 1%) shall be applicable for</li> </ol>
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			<p>execution part of the work only. It will not be applicable for supply schedule of works.</p> <p>(k) Income tax</p> <p>a. All payments shall be subject to TDS provisions in force from time to time.</p> <p>b. The Bidders are expected to submit certificates from competent authorities for lesser/ non-deduction of TDS.</p> <p>(l) Local Body Tax</p> <p>The Contractor shall certify on periodical basis that Local Body tax has been paid on all supplies to MAHA-METRO.</p>
39	Advance Payment/ Mobilization Advance	14.2	<p><b>Following Shall replace the corresponding provision in GCC</b></p> <p>The Employer shall make an advance payment, as an interest bearing loan for mobilization and cash flow support, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions detailed as under.</p> <p><b>(a) Mobilization Advance:</b></p> <p>interest bearing Mobilization advance shall be <b>10% of original contract value</b> payable in two equal instalments of 5% (Five Percent) each in the currencies and proportions of the Accepted Contract Amount</p> <p><b>Rate of interest shall be charged at "RBI Bank Rate+2% (Two percent)" simple interest.</b> Interest will be chargeable and calculated on reducing balance method.</p> <p>Mobilization advance shall be paid against acceptable Bank Guarantee issued from a Scheduled Commercial Indian Bank or Schedule Commercial Foreign Bank (Except Cooperative Bank) having business offices in India. The value of <b>Bank Guarantee taken towards security of "Advance Payment" / "Mobilization Advance"</b> shall be <b>110% of the advance amount</b> requested by the Contractor and valid for 60 Days beyond scheduled completion time. The validity of Advance Bank Guarantee shall be extended as per extended time of contract plus 60 days, if the Advance Amount is not recovered completely.</p> <p>The first installment shall be paid after award of Letter of Acceptance by employer and submission of</p>

			<p>Performance Guarantee / Security and Advance Bank Guarantee by Contractor.</p> <p>The second installment shall be paid on production of statement of effective and proper utilization of the first installment along with supporting documents duly accepted and certified (with or without modification) by the Engineer. The Contractor shall be required to submit the 'Utilization Certificate' of 1st installment along with Bank Guarantee @ 110% of 2nd installment, with his letter of request.</p> <p>The Contractor, once the 50% of mobilization advance has been recovered, shall have a onetime option to reduce the Bank Guarantee for the mobilization advance by the proportion to the amount recovered.</p> <p><b>(b) Amortization / Repayment of Advance Payment</b></p> <p>Recovery of the Advance Payment shall be done in respective currencies and shall commence when 20% of the original contract value of the work has been paid in respective currencies (in addition to the mobilisation advance) and shall be recovered by deduction of 20% of the amount of each interim payment until the total of mobilisation advance is recovered before payment of 80% of Contract price or before the expiry of original contract period or any extension as approved by the Employer for recovery of advance, whichever is earlier.</p> <p><b>(c) Deleted</b></p> <p><b>(d) Failure of contractor to repay the Advance Amount</b></p> <p>If the Contractor fails to repay the advance amount within the stipulated period of repayment as described above in Sub-Clause no. 14.2 (b) or its further extension by Employer, in such events Employer is empowered to encash the Bank Guarantee submitted by Contractor against the Advance Payment.</p> <p>Employer is also empowered to encash the Advance Bank Guarantee, if the Contract is terminated or foreclosed or whatever the reasons and Advance Amount is not repaid by Contractor</p> <p><b>(e) Advances to be Used only for This Work</b></p> <p>The advances shall be used by the Contractor strictly for the purpose of the Contract, and for the purpose for which they are paid. Under no circumstances, shall the advances be diverted for other purposes. Any such</p>
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			<div>diversion shall be construed as a breach of the Contract and the Contractor shall be asked to return the advance at once. The Contractor shall return the advance in one go without demur. The Employer reserves the right for any other remedy prescribed for breach of Contract in this regard.</div> <div>The Contractor, if required by the Employer shall provide the details of Mobilization advance expended or to be expended.</div>
40	Schedule of Payments	14.4	<p><b><i>(Following Shall replace the corresponding provision in GCC)</i></b></p> <p>The contractor must understand clearly that the rates quoted are for completed work and include all costs due to labour, all leads and lifts involved and if further necessitated scaffolding, plant, Machinery, supervision, service works, power, etc. and to include all expenses to cover the cost of night and round the clock work as and when required and no claim for additional payment beyond the prices or rates quoted will be entertained and the tenderers will not entitled subsequently to make any claim on the ground of any representation or on any promise by any person (whether member in the employment of any Public Works Department or not) or on the ground of any failure on this part to obtain all necessary information for the purpose of making his tender and fixing the several prices and rates therein relieve him from any risks or liabilities arising out of the tender. The mode of measurements has been indicated in the specification.</p> <p>A) Running Bill : One Payment in a month will be granted by the Engineer-in-charge Contractor should submit bills to the Engineer -in -charge in appropriate forms. The payment will be entertained by the department.</p> <p>B) Final Bill: The contractor should submit final bill within one month after completion of the work and the bill will be paid within 3 months if it is in order. Disputed item and claims if any shall be</p>

			<p>excluded from the final bill and settled separately later on.</p> <p>Bills for extra work or for any claim shall be paid separately apart from the Interim bill for the main work. The payment of bills for the main works shall not be withheld for want of decision on the extras or claims not covered in the appendices.</p> <p>Claims for extra work shall be registered within 30 days of occurrences of the event. However, bills for these claims including supporting data/details may be submitted subsequently.</p>
41	<b>Percentage of Retention</b>	14.3 (c)	<b>0% (Zero percentage)</b> <b>(No retention from bill is applicable in this contract)</b>
42	<b>Limit of Retention Money</b>	14.3 (c)	<b>0% (Zero percentage)</b> <b>(No retention from bill is applicable in this contract)</b>
43	<b>Plant and Materials intended for the Works</b>	14.5	Not applicable to this tender
44	Deleted	Deleted	deleted
45	<b>Minimum Amount of Interim Payment Certificates</b>	14.6	0.5% of the Contract Price
46	<b>Payment of retention Money</b>	14.9	Not applicable to this bid
47	<b>Currencies of Payment</b>	14.15	The Contract Price shall be paid in the currency(ies) named in the Contract i.e., INR (Indian Rupees)
48	<b>Currencies of Payment</b>	14 . 15	In item no. (e) of Sub-Clause 14.15 the "Central Bank of the country" would mean the Reserve Bank of India and the base date will be the date of submission of the bill.
49	<b>Limit of Liability</b>	17.6	100% of the Total Contract Price
50	<b>Use of Employer's</b>	17.7	No accommodation/ facilities shall be provided by employer.

	Accommodation /Facilities		
51	General Requirement for insurance	18.1	The insurance servicing for this contract for CAR and other Insurances are shall obtain all insurances required in the Contract from Insurance companies operating in India.
52	Prime beneficiary of Insurance, Insuring Party & Other Party	18.1	<b>Prime beneficiary of Insurance:</b> Maharashtra Metro Rail Corporation Limited Contractor shall be <b>"Insuring Party"</b> Maha- Metro shall be <b>"Other Party"</b>
53	Periods for submission of insurance:	18.1	In addition to the provisions in GCC, following shall be applicable:  i. Evidence of insurance 30 days from Commencement Date  ii. Submission relevant policies : 60 days from Commencement Date  iii. If the Contractor is insuring party & fails to submit the policy of insurance within 60 days or submit the policy for lesser period or does not extend adequately, a penalty for such uninsured period as well as delay beyond 60 days <b>shall be recovered at "per day basis", proportionate to amount of premium</b> payable for the work from any monies due to the Contractor or if the amount is not sufficient the Performance <b>Guarantee shall be retained</b> by Employer till Contractor pays the dues towards renewal of these insurances.
54	Maximum Permissible Deductibles	18.2 (d)	INR 05 Lakhs for each occurrence under CAR insurance Policy
55	CAR Policy	18.2 (g)	Applicable to this work
56	Validity of insurance policies	18.2 (i)	Till 06 (Six) Months beyond the expiry of OLP
57	Insurance against injury to persons and damage to Property	18.3	Upto INR 05 Lakhs per occurrence, with number of occurrences unlimited

58	<b>Insurance for Contractor's Personnel</b>	18.4	<p>Contractor shall obtain Employee's Compensation Policy (Workmen's Compensation Policy) as per Employees Compensation Act 1923</p> <p>The insurance shall be maintained in full force and effect during the whole time that the Contractor's Personnel are assisting in the execution of the Works. For any person employed by a Subcontractor, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for the Subcontractor's compliance with this Sub-Clause.</p> <p>This shall supersede the provision at 18.2 (i) of GCC only for the purpose of Employee's Compensation Policy</p>
59	<p><b>Amount of Professional Indemnity Insurance (PII) (for Design Work if applicable)</b></p> <p><b>(This Clause is not applicable to this tender)</b></p>	18.5(PC)	<p><b>(This Clause is not applicable to this tender)</b></p> <p>AOA (any one accident) limit equal to 6% of the contract value against <b>Schedule 'B' (Lumpsum Component of Viaduct)</b> of Price Bid in respect of 'design and construct' with AOY (any one year) limit of 2 incidents in a year. In the Professional Indemnity Insurance Policy, the deductible amount shall not be more than 5% AOA limit. All Policy shall be obtained within Four weeks from 'date of commencement' and shall be valid for five years after date of issue of 'Performance Certificate' or 3 years after commencement of commercial train operations whichever is later. Wherever the Contractor submits policy for shorter period / annual renewable policy, the same shall be renewed before its expiry date. In such situation, the performance guarantee shall be retained till required validity period. The Contractor's submission of such shorter period / renewable policy shall be construed as their irrevocable consent for retention of the performance guarantee.</p>
60	<b>Optional Termination, Payment and Release</b>	19.6	Replace "84 days" and "140 days" mentioned in the sub-clause with "184 days" and "340 days" respectively.
61	<b>Dispute Board</b>	20.3	Annexure-IX-A
62	<b>The Dispute Board shall be comprised of</b>	20.3	Annexure-IX-A
63	<b>List of potential DB sole members</b>	20.3	Shall be nominated by Employer

64	<b>No legal action till Dispute Settlement Procedure is exhausted</b>	20.3	Any and all Disputes shall be settled in accordance with the provisions of Clause 20. No action at law concerning or arising out of any Dispute shall be commenced unless and until all applicable Dispute resolution procedures set out in Clause 20 shall have been finally exhausted in relation to that Dispute or any Dispute out of which that Dispute shall have arisen with which it may be or may have been connected.
65	<b>Appointment (if not agreed) to be made by</b>	20.4	After failure of negotiation/ conciliations of mutual settlements the issues may be referred for arbitration.
65	<b>Notice of Dispute</b>	20.4	For the purpose of Sub-Clause 20.5, a Dispute shall be deemed to arise when one party serves on the other party a notice in writing (hereinafter called a ("Notice of Dispute") stating the nature of the Dispute provided that no such notice shall be served later than 28 days after the date of issue of Performance Certificate by the Engineer.
66	<b>Two stages for Dispute Resolution</b>	20.5	Disputes shall be settled through two stages: a. Conciliation procedures as established by "The Arbitration and Conciliation Act-1996" (as amended from time to time) and in accordance with this Clause. In the event this procedure fails to resolve the Dispute then; b. Arbitration procedures undertaken as provided by "The Arbitration and Conciliation Act -1996" (as amended from time to time) and in accordance with this Clause.
67	<b>Rules of arbitration</b>	20.9	Rules of Arbitration in accordance with the Arbitration and Conciliation Act 1996 and its amendments further.
68	<b>Place of arbitration</b>	20.9	Pune
69	<b>Conciliation Procedure</b>	20.7 & 20.9	As per Annexure-IX-B
70	<b>Maintaining the Site</b>	Additional Clause	In general, the cleanliness, lighting, safety, security, drinking water, first aid etc. will be the responsibility of the contractor.  The Contractor shall be responsible for maintaining the site. The daily sweeping and cleaning of the area under his possession/work shall be his responsibility.  In case of repeated aberrations notices by the Engineer, a minimum penalty of Rs. 5000/- shall be imposed for each instance.



71	<b>EIA&amp;SIA</b> (This Clause is not applicable to this tender)	Additional Clause	<p><b>(This Clause is not applicable to this tender)</b></p> <p>The Employer will engage suitable agencies for performing Environmental Impact Assessment and Social Impact Assessment due to the Project. These agencies will suggest appropriate monitoring mechanism as well as mitigation measures for implementation by MAHA-METRO. The Contractor will be required to implement these measures as part of its obligation under SHE Manual / other relevant conditions. In case, implementing these measures are beyond the scope of work as detailed in Bidding Documents, the same shall be taken up as a Variation.</p>
72	<b>Interface Requirements</b>	Additional Clause	<p>The Contractor shall be responsible to interface with the other contractors as per the interface table provided in the contract. Employer will supervise/facilitate the coordination between the Contractor and other designated contractors. However, the Contractor will allow for liaison with, and modifications to his design to cater for the work of such other contractors. The list of interface items is indicative only (as per Annexure-VII-6) and the ultimate responsibility of commissioning lies with the Contractor.</p>
73	<b>Pre-Completion Incentives</b>	Additional Clause	<p><b>Deleted</b></p> <p>This clause is not applicable to this tender</p>
74	<b>OHSAS: 18001</b> (This Clause is not applicable to this tender)		<p><b>(This Clause is not applicable to this tender)</b></p> <p>The contractor must obtain Health and Safety Certificate</p> <p>The contractor shall deploy at least two key personnel having Environment expertise of minimum ten years in sites management measure and the second one in social works with min. 10 year experience.</p>
75	<b>Site Mobility</b>		<p>Annexure-IX-C</p> <p>The Contractor shall provide a) Innova/equivalent (7 seater)- 1 no. &amp; b) Dezire/equivalent (5 seater)- 2 no. having AC facility for the use of the Employer within one month from the date of commencement of the. The Contractor will bear all expenses connected with the operation and the maintenance of this vehicle, including driver's wages, overtime and other benefits, cost of the fuel, lubricant, repairs and maintenance, third party insurance, any other related expenses etc. to the satisfaction of the Engineer. The vehicle shall be replaced with a new vehicle during breakdown time, failing which the Employer will hire the vehicle at the risk and cost of the Contractor.</p>

76	<b>Site Office for Employer</b>		<p>Annexure-IX-C</p> <p>The Contractor, free of cost shall provide and maintain for the use of the Employer / Engineer office accommodation, equipment, and communication &amp; drawing facilities throughout the course of the work including Extension of Time. The details of the accommodation &amp; the other facilities are detailed in following paras. The cost of the Office accommodation and other facilities is deemed to be included in the cost quoted. The Furniture's, equipment and software provided will remain the property of the Employer. Site office accommodation, equipment's and transport facility shall be provided till 6 months beyond the actual completion period and nothing extra shall be paid on this account.</p>
77	<b>Approved make/vendor</b>		Annexure-IX-D (Not applicable for this Tender)
78	<b>Approved make/vendor (Plumbing)</b>		Annexure-IX-E (Not applicable for this Tender)
79	<b>Approved Laboratory</b>		Annexure-IX-F (Not applicable for this Tender)
80	<b>Key Dates &amp; Penalties</b>		Annexure- IX-G (Not applicable for this Tender)
81	<b>Design Requirements</b> (Not Applicable to this tender)		Annexure-IX-H (Not Applicable to this tender)
82	<b>IT/ 5D BIM Requirement of the employers</b> (Not Applicable to this tender)		Annexure -IX-I (Not Applicable to this tender)

**Annexure IX-A****A General Conditions of Dispute Board Agreement****1. Definitions**

Each "Dispute Board Agreement" is a tripartite agreement by and between:

- (a) the "Employer";
- (b) the "Contractor"; and
- (c) the "Member" who is defined in the Dispute Board Agreement as being:
  - (i) the sole member of the "DB" and, where this is the case, all references to the "Other Members" do not apply, or
  - (ii) one of the three persons who are jointly called the "DB" (or "Dispute Board") and, where this is the case, the other two persons are called the "Other Members".

The Employer and the Contractor have entered (or intend to enter) into a contract, which is called the "Contract" and is defined in the Dispute Board Agreement, which incorporates this Appendix. In the Dispute Board Agreement, words and expressions which are not otherwise defined shall have the meanings assigned to them in the Contract.

**2. General Provisions**

Unless otherwise stated in the Dispute Board Agreement, it shall take effect on the latest of the following dates:

- (a) the Commencement Date defined in the Contract,
- (b) when the Employer, the Contractor and the Member have each signed the Dispute Board Agreement, or
- (c) when the Employer, the Contractor and each of the Other Members (if any) have respectively each signed a dispute board agreement.

This employment of the Member is a personal appointment. At any time, the Member may give not less than 70 days' notice of resignation to the Employer and to the Contractor, and the Dispute Board Agreement shall terminate upon the expiry of this period.

**3. Warranties**

The Member warrants and agrees that he/she is and shall be impartial and independent of the Employer, the Contractor and the Engineer. The Member shall promptly disclose, to each of them and to the Other Members (if any), any fact or circumstance which might appear inconsistent with his/her warranty and agreement of impartiality and independence.

When appointing the Member, the Employer and the Contractor relied upon the Member's representations that he/she is:

- (a) experienced in the work which the Contractor is to carry out under the Contract,
- (b) experienced in the interpretation of contract documentation, and
- (c) fluent in the language for communications defined in the Contract.

**4. General  
Obligations of the  
Member**

The Member shall:

- (a) have no interest financial or otherwise in the Employer, the Contractor or Engineer, nor any financial interest in the Contract except for payment under the Dispute Board Agreement;
- (b) not previously have been employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except in such circumstances as were disclosed in writing to the Employer and the Contractor before they signed the Dispute Board Agreement;
- (c) have disclosed in writing to the Employer, the Contractor and the Other Members (if any), before entering into the Dispute Board Agreement and to his/her best knowledge and recollection, any professional or personal relationships with any director, officer or employee of the Employer, the Contractor or the Engineer, and any previous involvement in the overall project of which the Contract forms part;
- (d) not, for the duration of the Dispute Board Agreement, be employed as a consultant or otherwise by the Employer, the Contractor or the Engineer, except as may be agreed in writing by the Employer, the Contractor and the Other Members (if any);
- (e) comply with the annexed procedural rules and with Sub-Clause 20.4 of the Conditions of Contract;
- (f) not give advice to the Employer, the Contractor, the Employer's Personnel or the Contractor's Personnel concerning the conduct of the Contract, other than in accordance with the annexed procedural rules;
- (g) not while a Member enter into discussions or make any agreement with the Employer, the Contractor or the Engineer regarding employment by any of them, whether as a consultant or otherwise, after ceasing to act under the Dispute Board Agreement;
- (h) ensure his/her availability for all site visits and hearings as are necessary;
- (i) become conversant with the Contract and with the progress of

the Works (and of any other parts of the project of which the Contract forms part) by studying all documents received which shall be maintained in a current working file;

- U) treat the details of the Contract and all the DB's activities and hearings as private and confidential, and not publish or disclose them without the prior written consent of the Employer, the Contractor and the Other Members (if any); and
- (k) be available to give advice and opinions, on any matter relevant to the Contract when requested by both the Employer and the Contractor, subject to the agreement of the Other Members (if any).

## **5. General Obligations of the Employer and the Contractor**

The Employer, the Contractor, the Employer's Personnel and the Contractor's Personnel shall not request advice from or consultation with the Member regarding the Contract, otherwise than in the normal course of the DB's activities under the Contract and the Dispute Board Agreement. The Employer and the Contractor shall be responsible for compliance with this provision, by the Employer's Personnel and the Contractor's Personnel respectively.

The Employer and the Contractor undertake to each other and to the Member that the Member shall not, except as otherwise agreed in writing by the Employer, the Contractor, the Member and the Other Members (if any):

- (a) be appointed as an arbitrator in any arbitration under the Contract;
- (b) be called as a witness to give evidence concerning any dispute before arbitrator(s) appointed for any arbitration under the Contract; or
- (c) be liable for any claims for anything done or omitted in the discharge or purported discharge of the Member's functions, unless the act or omission is shown to have been in bad faith.

The Employer and the Contractor hereby jointly and severally indemnify and hold the Member harmless against and from claims from which he is relieved from liability under the preceding paragraph.

Whenever the Employer or the Contractor refers a dispute to the DB under Sub-Clause 20.4 of the Conditions of Contract, which will require the Member to make a site visit and attend a hearing, the Employer or the Contractor shall provide appropriate security for a sum equivalent to the reasonable expenses to be incurred by the Member. No account shall be taken of any other payments due or paid to the Member.

## **6. Payment**

The Member shall be paid as follows, in the currency named in the

## Dispute Board Agreement:

- (a) a retainer fee per calendar month, which shall be considered as payment in full for:
  - (i) being available on 28 days' notice for all site visits and hearings;
  - (ii) becoming and remaining conversant with all project developments and maintaining relevant files;
  - (iii) all office and overhead expenses including secretarial services, photocopying and office supplies incurred in connection with his duties; and
  - (iv) all services performed hereunder except those referred to in sub-paragraphs (b) and (c) of this Clause.

The retainer fee shall be paid with effect from the last day of the calendar month in which the Dispute Board Agreement becomes effective; until the last day of the calendar month in which the Taking-Over Certificate is issued for the whole of the Works.

With effect from the first day of the calendar month following the month in which the Taking-Over Certificate is issued for the whole of the Works, the retainer fee shall be reduced by one third. This reduced fee shall be paid until the first day of the calendar month in which the Member resigns or the Dispute Board Agreement is otherwise terminated.

- (b) a daily fee which shall be considered as payment in full for:
  - (i) each day or part of a day up to a maximum of two days' travel time in each direction for the journey between the Member's home and the Site, or another location of a meeting with the Other Members (if any);
  - (ii) each working day on Site visits, hearings or preparing decisions; and
  - (iii) each day spent reading submissions in preparation for a hearing.
- (c) all reasonable expenses including necessary travel expenses (air fare in less than first class, hotel and subsistence and other direct travel expenses) incurred in connection with the Member's duties, as well as the cost of telephone calls, courier charges, faxes and telexes: a receipt shall be required for each item in excess of five percent of the daily fee referred to in sub-paragraph (b) of this Clause;
- (d) any taxes properly levied in the Country on payments made to the Member (unless a national or permanent resident of the

Country) under this Clause 6.

The retainer and daily fees shall be as specified in the Dispute Board Agreement. Unless it specifies otherwise, these fees shall remain fixed for the first 24 calendar months, and shall thereafter be adjusted by agreement between the Employer, the Contractor and the Member, at each anniversary of the date on which the Dispute Board Agreement became effective.

If the parties fail to agree on the retainer fee or the daily fee, the appointing entity or official named in the Contract Data shall determine the amount of the fees to be used.

The Member shall submit invoices for payment of the monthly retainer and air fares quarterly in advance. Invoices for other expenses and for daily fees shall be submitted following the conclusion of a Site visit or hearing. All invoices shall be accompanied by a brief description of activities performed during the relevant period and shall be addressed to the Contractor.

The Contractor shall pay each of the Member's invoices in full within 56 calendar days after receiving each invoice and shall apply to the Employer (in the Statements under the Contract) for reimbursement of one-half of the amounts of these invoices. The Employer shall then pay the Contractor in accordance with the Contract.

If the Contractor fails to pay to the Member the amount to which he/she is entitled under the Dispute Board Agreement, the Employer shall pay the amount due to the Member and any other amount which may be required to maintain the operation of the DB; and without prejudice to the Employer's rights or remedies. In addition to all other rights arising from this default, the Employer shall be entitled to reimbursement of all sums paid in excess of one-half of these payments, plus all costs of recovering these sums and financing charges calculated at the rate specified in Sub-Clause

14.8 of the Conditions of Contract.

If the Member does not receive payment of the amount due within 70 days after submitting a valid invoice, the Member may (i) suspend his/her services (without notice) until the payment is received, and/or (ii) resign his/her appointment by giving notice under Clause 7.

## **7. Termination**

At any time: (i) the Employer and the Contractor may jointly terminate the Dispute Board Agreement by giving 42 days' notice to the Member; or (ii) the Member may resign as provided for in Clause 2.

If the Member fails to comply with the Dispute Board Agreement, the Employer and the Contractor may, without prejudice to their other rights, terminate it by notice to the Member. The notice shall

take effect when received by the Member.

If the Employer or the Contractor fails to comply with the Dispute Board Agreement, the Member may, without prejudice to his other rights, terminate it by notice to the Employer and the Contractor. The notice shall take effect when received by them both.

Any such notice, resignation and termination shall be final and binding on the Employer, the Contractor and the Member. However, a notice by the Employer or the Contractor, but not by both, shall be of no effect.

#### **8. Default of the Member**

If the Member fails to comply with any of his obligations under Clause 4 (a) - (d) above, he shall not be entitled to any fees or expenses hereunder and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses received by the Member and the Other Members (if any), for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

If the Member fails to comply with any of his obligations under Clause 4 (e) - (k) above, he shall not be entitled to any fees or expenses hereunder from the date and to the extent of the non-compliance and shall, without prejudice to their other rights, reimburse each of the Employer and the Contractor for any fees and expenses already received by the Member, for proceedings or decisions (if any) of the DB which are rendered void or ineffective by the said failure to comply.

#### **9. Disputes**

Any dispute or claim arising out of or in connection with this Dispute Board Agreement, or the breach, termination or invalidity thereof, shall be finally settled by institutional arbitration. If no other arbitration institute is agreed, the arbitration shall be conducted under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with these Rules of Arbitration.



**Annexure IX-B****Conciliation Procedure****No Legal action till Dispute Settlement Procedure is exhausted.**

Any and all Disputes shall be settled in accordance with the provisions of Dispute Resolution Clause. No action at law concerning or arising out of any Dispute shall be commenced unless and until all applicable Dispute Resolution Procedures shall have been finally exhausted in relation to that Dispute or any Dispute out of which that Dispute shall have arisen with which it may be or may have been connected.

**Notice of Dispute**

For the purpose of this Sub-Clause, a Dispute shall be deemed to arise when one party serves on the other party a notice in writing (hereinafter called a "Notice of Dispute") stating the nature of the Dispute provided that no such notice shall be served later than 30 days after the date of completion of Contract.

**Two Stages for Dispute Resolution**

Disputes shall be settled through two stages:

- a) Conciliation procedures as established by "The Arbitration and Conciliation Act-1996" & amended by the Arbitration & Conciliation (Amendment) Act, 2015 and any statutory modification or re-enactment thereof and in accordance with this clause. In the event this procedure fails to resolve the Dispute then;
- b) Arbitration procedures undertaken as provided by "The Arbitration and Conciliation Act-1996" & amended by the Arbitration & Conciliation (Amendment) Act, 2015 and any statutory modification or re-enactment thereof and in accordance with this clause.

**Conciliation**

Within 60 days of receipt of Notice of Dispute, either party shall refer the matter in dispute to conciliation.

Conciliation proceedings shall be initiated within 30 days of one party inviting the other in writing to Conciliation. Conciliation shall commence when the other party accepts in writing this invitation. If the invitation is not accepted, then Conciliation shall not take place. If the party initiating conciliation does not receive a reply within 30 days from the date on which he sends the invitation, he may elect to treat this as a rejection of the invitation to conciliate and inform the other party accordingly.

The Conciliation shall be undertaken by one Conciliator selected from a panel of Conciliators maintained by the Employer. The Conciliator shall assist the parties to reach an amicable settlement in an independent and impartial manner.

**Conciliation procedure**

The Employer shall maintain a panel of Conciliators, who shall be from serving or retired Engineers of Government Departments, or of Public Sector Undertakings. Out of this panel, a list of three Conciliators shall be sent to the Contractor who shall choose one of them to act as Conciliator and conduct conciliation proceedings in accordance with "The Arbitration and Conciliation Act, 1996" of India & amended by the Arbitration & Conciliation (Amendment) Act, 2015 and any statutory modification or re-enactment thereof. There will be no objection if conciliator so nominated is a serving employee of Maha- Metro who would be Deputy HOD level officer and above. The Employer and the Contractor shall in good faith co-operate with the Conciliator and, in particular, shall endeavour to comply with requests by the Conciliator to submit written materials, provide evidence and attend meetings. Each party may, on his own initiative or at the invitation of the Conciliator, submit to the Conciliator suggestions for the settlement of the dispute. When it appears to the Conciliator that there exist elements of a settlement which may be acceptable to the parties, he shall formulate the terms of possible settlement and submit them to the parties for their observations. After receiving the observations of the parties, the Conciliator may reformulate the terms of a possible settlement in the light of such observations.

If the parties reach agreement on a settlement of the dispute, then may draw up and sign a written settlement agreement. If requested by the parties, the Conciliator may draw up, or assist the parties in drawing up, the settlement agreement. When the parties sign the settlement agreement, it shall be final and binding on the parties and persons claiming under them respectively. The Conciliator shall authenticate the settlement agreement and furnish a copy thereof to each of the parties. As far as possible, the conciliation proceedings should be completed within 60 days of the receipts of notice by the Conciliator.

The parties shall not initiate, during the conciliator proceedings, any arbitral or judicial proceedings in respect of a dispute that is the subject matter of the conciliation proceedings.

**Termination of Conciliation proceedings**

The conciliation proceedings shall be terminated:

- a) By the signing of the settlement agreement by the parties on the date of agreement;  
or
- b) By written declaration of the conciliator, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of such declaration; or
- c) By a written declaration of the parties to the conciliator to the effect that the conciliation proceedings are terminated, on the date of declaration; or
- d) By a written declaration of a party to the other party and the conciliator, if appointed, to the effect that the conciliation proceedings are terminated, on the date of declaration.

Upon termination of the conciliation proceedings, the conciliator shall fix the costs of the conciliation and give written notice thereof to the parties. The costs shall be borne equally by the parties unless settlement agreement provides for a different apportionment. All other expenses incurred by a party shall be borne by that party.

**Arbitration**

If the efforts to resolve all or any of the disputes through conciliation fails, then such disputes or differences, whatsoever arising between the parties, arising out of or relating to construction/ manufacture, measuring operation or effect of the License Agreement or the breach thereof shall be referred to Arbitration in accordance with the following provisions:

- a) Only such dispute(s) or difference(s) in respect of which notice has been made but could not be settled through Conciliation, together with counter claims or set off, given by the employer, shall be referred to arbitration. Other matters shall not be included in the reference.
- b) The Arbitration proceedings shall be assumed to have commenced from the day, a written and valid demand for arbitration is received by Managing Director, Maharashtra Metro Rail Corporation Limited, Pune (MD/Maha Metro).
- c) The disputes so referred to arbitration shall be settled in accordance with the Indian Arbitration & Conciliation Act, 1996 & amended by the Arbitration & Conciliation (Amendment) Act, 2015 and any statutory modification or re-enactment thereof.

Further, it is agreed between the parties as under:

**Number of Arbitrations: The Arbitral Tribunal shall consist of:**

- i) Sole Arbitrator in cases where the total value of all claims in question added together does not exceed Rs. 3.00 crores;
- ii) 3{Three} Arbitrators in all other cases.

**Procedure for Appointment of Arbitrators: The Arbitrators shall be appointed as per following procedure:**

- i) In case of Sole Arbitrator: Within 60 days from the day when a written and valid demand for arbitration is received by MD/ Maha Metro, the Employer will forward a panel of 03 names to the Contractor. The Contractor shall have to choose one Arbitrator from the panel of three, to be appointed as Sole Arbitrator within 30 days of dispatch of the request by the Employer. In case the Contractor fails to choose one Arbitrator within 30 days of dispatch of panel of arbitrators by Maha Metro then MD/Maha Metro shall appoint anyone Arbitrator from the panel of 03 Arbitrator as Sole Arbitrator.
- ii) In case of 03 Arbitrators:
  - a) Within 60 days from the day when a written and valid demand for Arbitration is received by MD/Maha Metro, the Employer will forward a panel of 5 names

to the Contractor. The Contractor will then give his consent for any name out of the panel to be appointed as one of the Arbitrators within 30 days of dispatch of the request by the Employer.

- b) Employer will decide the second Arbitrator. MD/ Maha Metro shall appoint the two Arbitrators, including the name of one Arbitrator for whom consent was given by the Contractor, within 30 days from the receipt of the consent for one name of the Arbitrator from the Contractor. In case the Contractor fails to give his consent within 30 days of dispatch of the request of the Employer then MD/Maha Metro shall nominate both the Arbitrators from the panel.
- c) The third Arbitrator shall be chosen by the two Arbitrators so appointed by the parties out of the panel of 05 Arbitrators provided to Contractor or from the larger panel of Arbitrators to be provided to them by Employer at the request of two appointed Arbitrators (if so desired by them) and who shall act as Presiding Arbitrator. In case of failure of the two appointed Arbitrators to reach upon consensus within a period of 30 days from their appointment, then upon the request of either or both parties, the Presiding Arbitrator shall be appointed by the Managing Director/ Maha Metro, Pune.
- d) If one or more of the Arbitrators appointed as above refuses to act as Arbitrator, withdraws from his office as Arbitrator, or vacates his / their office/ offices or is / are unable or unwilling to perform his functions as Arbitrator for any reason whatsoever or dies or in the opinion of the MD/Maha Metro fails to act without undue delay, the MD/Maha Metro shall appoint new Arbitrator/ Arbitrators to act in his/ their place except in case of new Presiding Arbitrator who shall be chosen following the same procedure as mentioned in para (ii) (c ) above. Such re-constituted Tribunal may, at its discretion, proceed with the reference from the stage at which it was left by the previous Arbitrator(s).
- e) The Employer at the time of offering the panel of Arbitrator (s) to be appointed as Arbitrator shall also supply the information with regard to the qualifications of the said Arbitrators nominated in the panel along with their professional experience, phone nos. and addresses to the Contractor.

Qualification and Experience of Arbitrators (to be appointed as per sub-clause above): The Arbitrators to be appointed shall have minimum qualification and experience as under:

Arbitrator shall be; a Working/ Retired Officer (not below E-7 grade in a PSU with which Maha -Metro has no business relationship) of any discipline of Engineering or Accounts/ Finance Department, having experience in Contract Management;

Or

A Retired Officer ( retired not below the SAG level in Railways) of any Engineering Services of Indian Railways or Indian Railway Accounts Service, having experience in Contract Management; or a Retired Office who should have retired more than 3 years previously

from the date of appointment as Arbitrator (retired not below E-8 grade in Maha Metro or a PSU with which Maha Metro has a business relationship) of any Engineering discipline or Accounts/ Finance Department, having experience in Contract Management or Retired Judge of any High Court or Supreme Court of India or reputed Chartered Accountant & should be member of ICAI, New Delhi. No person other than the persons appointed as per above procedure and having above qualification and experience shall act as Arbitrator.

No new claim shall be added during proceedings by either party. However, a party may amend or supplement the original claim or defence thereof during the course of arbitration proceedings subject to acceptance by Tribunal having due regard to the delay in making it.

Neither party shall be limited in the proceedings before such arbitrator(s) to the evidence or arguments put before the Conciliator for the purpose of obtaining his decision. No decision given by the Conciliator in accordance with the foregoing provisions shall disqualify him from being called as a witness and giving evidence before the arbitrator(s) on any matter, whatsoever, relevant to dispute or difference referred to arbitrator/s. Neither party shall be limited in the proceedings before such arbitrators to the evidence.

It is agreed by both the Parties that in the cases where Arbitral Tribunal consists of sole Arbitrator, their disputes shall be resolved by fast track procedure specified in sub-section (3) of 29B of the Arbitration and Conciliation (Amendment) Act, 2015 or as amended up to date.

If the Contractor (s) does/do not prefer his/their specific and final claims in writing, within a period of 90 days of receiving the intimation from the Employer/ Conciliator that the final demand is ready, he / they will be deemed to have waived his/their claim(s) and the Employer shall be discharged and released of all liabilities under the License Agreement in respect of these claims.

Arbitration proceedings shall be held at Pune, India and the language of the arbitration proceedings and that of all documents and communications between the parties shall be in English.

The Arbitral Tribunal should record day to day proceedings. The proceedings shall normally be conducted on the basis of documents and written statements. All Arbitration awards shall be in writing and shall state item wise, the sum and detailed reasons upon which it is based. A model time scheduled for conduct of Arbitration proceedings in a period of 180 days/365 days will be made available to Arbitral Tribunal for their guidance (180 days is for fast track Arbitration and 365 days for other Arbitrations). Both the parties should endeavor to adhere to time scheduled for early finalization of Award.

The Award of the sole Arbitrator or the award by majority of three Arbitrators as the case may be shall be binding on all parties. Any ruling on award shall be made by a majority of members of Tribunal. In the absence of such a majority, the views of the Presiding Arbitrator shall prevail.

A party may apply for correction of any computational errors, any typographical or clerical errors or any other error of similar nature occurring in the award of a tribunal and

interpretation of specific point of award to tribunal within 60 days of the receipt of award party may apply to tribunal within 60 days of receipt of award to make an additional award as to claims presented in the arbitral proceedings but omitted from the arbitral award.

**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 the period it is accrued, till the date on which the award is made.

**Cost of Conciliation/ Arbitration**

The fees and other charges of the Conciliator/ Arbitrators shall be as per the scales fixed by the Employer from time to time irrespective of the fact whether the Arbitrator(s) is / are appointed by the Employer or by the Court of law unless specifically directed by Hon'ble Court otherwise on the matter, and shall be shared equally by the Employer and the Contractor. However, the expenses incurred by each party in connection with the preparation, presentation will be borne by itself. The latest scale of fee & other charges shall be fixed by Maha -Metro.

**Jurisdiction of Courts**

Where recourse to a Court is to be made in respect of any matter, the Court at Pune shall have the exclusive jurisdiction to try all disputes between the parties.

# MAHARASHTRA METRO RAIL CORPORATION LIMITED

## BID DOCUMENTS

### FOR

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

TENDER NO. P1Misc-32/2024

PART 3:  
SECTION-X CONTRACT FORMS



**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)

Website: [www.punemetrorail.org](http://www.punemetrorail.org)

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**Contract Form-1****Notification of Award****LETTER OF ACCEPTANCE***[letter head paper of the Employer]**[date]*To: *[name and address of the Contractor]*

This is to notify you that your Bid dated *[date]* for execution of the *[name of the Contract and identification number, as given in the Contract Data]* for the Accepted Contract Amount *[amount in numbers and words] [name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our institution.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose one of the Performance Security Forms included in Section X – Contract Forms, of the Bidding Documents

Authorized Signature: \_\_\_\_\_

Name and Title of Signatory: \_\_\_\_\_

Name of institution: \_\_\_\_\_

**Attachment: Contract Agreement**

**Contract Form-2****Contract Agreement**

THIS AGREEMENT made the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, between Maharashtra Metro Rail Corporation Limited, Pune (hereinafter “the Employer” or Maha-Metro), of the one part, and \_\_\_\_\_ of \_\_\_\_\_ (hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as \_\_\_\_\_ should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein, in the sum of *[insert Contract Price or Ceiling in words and figures, expressed in the Contract currency(ies)]* (hereinafter called “the Contract Price”).

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.
  - (a) the Letter of Acceptance (LOA)
  - (b) Accepted Financial Bid & Bill of Quantities
  - (c) Corrigendum / Addendum/ Clarifications
  - (d) the Particular Condition of Contract (PCC)
  - (e) the General Conditions (GC)
  - (f) the Work Specification & Employer’s Requirement,
  - (g) the Drawings,
  - (h) Contractor’s Submissions
  - (i) and any other reference documents forming part of the Contract.

If an ambiguity or discrepancy is found in the documents, the Employer shall issue any necessary clarification or instruction by approval of competent authority.

3. In consideration of the payments to be made by the Employer to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of \_\_\_\_\_ on the day, month and year specified above.

Signed by \_\_\_\_\_ (for the Employer)

Signed by \_\_\_\_\_ (for the Contractor)

**Note:-**

*The costs of stamp duties and similar charges (if any) imposed by law and as per Stamp Duty Act (amended from time to time) of state in which the work is executed, in connection to entering into the Contract Agreement, shall be borne by the Contractor.*

**Contract Form-3****Performance Security****(Demand Guarantee)****Beneficiary:** \_\_\_\_\_**Date:** \_\_\_\_\_**PERFORMANCE GUARANTEE No.:** \_\_\_\_\_**Guarantor:** \_\_\_\_\_

We have been informed that \_\_\_\_\_ (hereinafter called "the Applicant") has entered into Contract No. \_\_\_\_\_ dated \_\_\_\_\_ with the Beneficiary, for the execution of \_\_\_\_\_ (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor, hereby irrevocably without any demure, reservation, context, recourse or protest and or without any reference to the contractor, undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of \_\_\_\_\_ (),<sup>1</sup> such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's first demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the .... Day of ....., 2...<sup>2</sup>, and any demand for payment under it must be received by us at this office indicated above on or before that date.

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

\_\_\_\_\_  
[signature(s)]

***Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.***

<sup>1</sup> The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

<sup>2</sup> Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

**Contract Form-4****Advance Payment Security****BANK GUARANTEE FOR MOBILISATION ADVANCE**

To  
 Maharashtra Metro Rail Corporation Ltd.,  
 Regd Office: Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
 411005, Maharashtra, INDIA

Bank Guarantee No. \_\_\_\_\_, dt. \_\_\_\_\_ for Rs. \_\_\_\_\_  
 (Rupees \_\_\_\_\_ only).

w.e.f. : \_\_\_\_\_  
 valid upto : \_\_\_\_\_  
 claim upto : \_\_\_\_\_

- In Consideration of M/s. Maharashtra Metro Rail Corporation Ltd., (hereinafter called "the Employer", which expression shall, unless repugnant to the context or subject thereof include his successor and assigns) having awarded M/s. \_\_\_\_\_ having its Registered Office at \_\_\_\_\_ (hereinafter referred to as "the Contractor", which expression shall unless repugnant to the context of meaning thereof include its successors, administrators, executors and assigns), a contract by issue of Employers Letter of Acceptance No. \_\_\_\_\_ dated \_\_\_\_\_ and the same having been mutually accepted by the Contractor, resulting in a Contract bearing No. \_\_\_\_\_ for Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) for Contract \_\_\_\_\_ :  
 (Name of work) \_\_\_\_\_  
 (hereinafter called "the Contract") and the Employer has agreed to make an advance payment to the Contractor for performance of the said Contract amounting to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) of Mobilisation Advance.
- We, \_\_\_\_\_ constituted under the \_\_\_\_\_ Act, 1955 having its Corporate Centre and Central Office at \_\_\_\_\_ and one of its Local Head Office at \_\_\_\_\_ and Branch Office at \_\_\_\_\_ (hereinafter referred to as "the Bank", which expression shall unless repugnant to the context of meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, immediately on demand any or all monies payable by the Contractor to the extent of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) as aforesaid at any time upto \_\_\_\_\_ without any demur, reservation, context, recourse or protest and or without any reference to the Contractor.

3. Any such demand made by the Employer on the Bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator and shall continue to be enforceable till the Employer discharges this guarantee. However, not later than expiry date of guarantee.
4. The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee, from time to time to vary the advance or to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting his guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor and to exercise the same at any time in any manner and either to enforce or to forebear to enforce any covenants, contained or implied, in the Contract between the Employer and Contractor or any other course or demand or security available to the Employer. The Bank shall not be redeemed to its obligation under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid of any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision have the effect of relieving the bank.
5. The Bank also agrees that the Employer at his option shall be entitled to enforce this Guarantee against this bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

Notwithstanding anything contrary contained in any law for the time being in force or banking practice this guarantee shall not be assignable or transferable by the beneficiary. Notice or invocation by any person such as assignee, transferee or agent of beneficiary shall not be entertained by the bank any invocation of guarantee can be made only by the beneficiary directly.

**Notwithstanding anything contained herein:**

- a) Bank liability under this Bank Guarantee shall not exceed Rs. \_\_\_\_\_  
(Rupees \_\_\_\_\_ only)
- b) This Bank Guarantee shall be valid upto \_\_\_\_\_.
- c) We are liable to pay the guarantee amount or part thereof under this Bank Guarantee only & only if you serve upon us a written claim or demand on or before \_\_\_\_\_.
- d) Thereafter all your rights under this guarantee shall be forfeited and we shall be released from all our liabilities hereunder irrespective of whether the guarantee in original is returned to us or not.

Dated \_\_\_\_\_.

**Contract Form-5****Retention Money Security****Demand Guarantee**\_\_\_\_\_ *[Guarantor letterhead or SWIFT identifier code]***Beneficiary:** \_\_\_\_\_ *[Insert name and Address of Employer]***Date:** \_\_\_\_\_ *[Insert date of issue]***RETENTION MONEY GUARANTEE No.:** *[Insert guarantee reference number]***Guarantor:** *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that \_\_\_\_\_ *[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. \_\_\_\_\_ *[insert reference number of the contract]* dated \_\_\_\_\_ with the Beneficiary, for the execution of \_\_\_\_\_ *[insert name of contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of *[insert thesecond half of the Retention Moneyorifthe amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money,thedifference between half of the Retention Money and the amount guaranteed under the Performance Security]* is to be made against a Retention Money guarantee.

At the request of the Applicant, we,as Guarantor, hereby irrevocably without any demure, reservation, context, recourse or protest and or without any reference to the contractor, undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of \_\_\_\_\_ *[insert amount in figures]()**[amount in words]*<sup>1</sup> upon receipt by us of the Beneficiary's first demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract,without your needing to prove or show grounds for your demand or the sum specified therein.

<sup>1</sup> *The Guarantor shall insert an amount representing the amount of the second half of the Retention Money or or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security and denominated either in the currency(ies) of the second half of the Retention Money as specified in the Contract, or in a freely convertible currency acceptable to the Beneficiary.*

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the second half of the Retention Money as referred to above has been credited to the Applicant on its account number \_\_\_\_\_ at \_\_\_\_\_ *[insert name and address of Applicant's bank]*.

This guarantee shall expire no later than the .... day of ....., 2...<sup>2</sup>, and any demand for payment under it must be received by us at the office indicated above on or before that date.

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

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<sup>2</sup> *Insert the same expiry date as set forth in the performance security, representing the date twenty-eight days after the completion date described in GC Clause 11.9. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months][one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*



**Contract Form-6****Form of Designer's Warranty**

**THIS AGREEMENT** is made the day of

**BETWEEN:**

- (1) [ ] [whose registered office is at]/[of] [ ] ("the Designer"); and
- (2) The Maharashtra Metro Rail Corporation Limited (together with its successors and assigns, "the Employer") of \_\_\_\_\_ [address].

**WHEREAS:**

- (a) By a contract \_\_\_\_\_ dated [ ] ("the Contract") made between (1) Maharashtra Metro Rail Corporation Limited ("the Employer") and (2) [ ] ("the Contractor"), the Contractor has agreed to design, execute, complete, test and commission (including Integrated Testing and Commissioning) and remedy any defect in the Works upon the terms and conditions contained in the Contract.
- (b) The Designer has had an opportunity of reading and noting the provisions of the Contract (other than details of the Contractor's prices and rates).
- (c) Pursuant to the Contract, the Contractor wishes to enter into an agreement with the Designer and Designer agrees to the wishes of the Contractor (the Consultancy agreement) to carry out the Contractor's obligations under the Contract in relation to the design and functions ascribed to the Designer in the Contract.
- (d) The Contract stipulates that the Contractor shall ensure that the Designer executes a warranty agreement in favour of the Employer.

**NOW IT IS HEREBY AGREED** as follows:

1. In consideration of the Employer not objecting to the Contractor and the Designer entering into the Consultancy Agreement, the Designer warrants and undertakes to the Employer that he has exercised and will continue to exercise all the skill and care to be expected of a professionally qualified and competent designer experienced in work of similar nature and scope as the Works in carrying out the design of the Works and in performing the other duties and functions ascribed to him in the Contract.
2. The Designer agrees that, in the event of the termination of the Contract by the Employer, the Designer will, if so required by notice in writing given by the Employer, except subject to Clause 4 the instructions of the Employer or his appointee to the exclusion of the Contractor in respect of the carrying out and completion of the Works upon the terms and conditions of the Consultancy Agreement.
3. The Designer further agrees that he will not, without first giving the Employer not less than 21 days' previous notice in writing, exercise any rights it may have to terminate the Consultancy Agreement or to treat the same as having been as repudiated by the Contractor or to discontinue the performance of any duties to be performed by the Designer pursuant thereto. The Designer's right to terminate the Consultancy Agreement or to treat the same as having been repudiated or to discontinue the performance thereof shall cease if, within such period of notice and subject to Clause 4, the Employer shall give notice in writing to the Designer requiring the Designer to accept the instructions of the Employer or his appointee to the exclusion of the Contractor in respect of the carrying out and completion of the Contract Works upon the terms and conditions of the Consultancy Agreement.

4. Any notice given by the Employer under Clause 2 or 3 shall state that the Employer or his appointee accepts liability for payment of the fees payable to the Designer under the Consultancy Agreement and for performance of the Contractor's obligations under the Consultancy Agreement, including payment of any fees outstanding at the date of such notice.
5. The Employer shall be entitled to assign the benefit of this Warranty at any time without the consent of the Designer being required.
6. All documents arising out of or in connection with this Warranty shall be served:
  - (1) upon the Employer at [ ] marked for the attention of [ ];
  - (2) upon the Designer at [ ].
7. The Employer and the Designer may change their respective nominated addresses for service of documents to another address in India but only by prior written notice to each other. All demands and notices must be in writing.
8. This Warranty shall be governed by and construed according to the laws for the time being in force in India.
9. Except to the extent (if any) expressly permitted by the Consultancy Agreement, the Designer shall not sub-contract any of the Designer's obligations under the Consultancy Agreement without the prior written consent of the Employer's Representative.
10. Without prejudice to its obligations under this Warranty, the Designer shall maintain with well established underwriters of repute and on terms and conditions reasonably acceptable to the Employer, professional indemnity insurance (as per sub-clause 18.1 of the General Conditions) in respect of the Designer and its sub-consultants for Indian Rupees ..... (*in words*..... Rupees) in relation to his design of the Works for any one occurrence or series of occurrences arising out of any one event from the date of notification of acceptance until 5 years after the issue of Performance Certificate for the whole of works. The Designer shall immediately inform the Employer if for any reason professional indemnity insurance is not maintained in accordance with this Warranty or becomes void or unenforceable.
11. Insofar as the patent, copyright or other intellectual property rights in any Design Data (as defined in the Contract), plans, calculations, drawings, documents, materials, computer software, know-how and information relating to the Works shall be vested in the Designer, the Designer grants to the Employer his successors and assigns a royalty-free, non-exclusive and irrevocable licence (carrying the right to grant sub-licences) to use and reproduce any of the works designs or inventions incorporated and referred to in such documents or materials and any such know-how and information for all purposes relating to the Works (including without limitation the design, construction, reconstruction, completion, reinstatement, extension, repair and operation of the Works). To the extent beneficial ownership of any such patent, copyright or other intellectual property right is vested in anyone other than the Designer or the Contractor, the Designer shall use his best endeavors to procure that the beneficial owner thereof shall grant a like licence to the Employer. Any such licence granted shall not be determined if the Designer shall for any reason cease to be employed in connection with the Works.
12.
  - (1) Any dispute or difference of any kind whatsoever between the Employer and the Designer arising out of or in connection with this Warranty shall be referred to arbitration in accordance with Clause 20 of GC "Claims, Disputes and Arbitration" as defined in the Contract shall be deemed to include any such dispute or difference between the Employer and the Designer.
  - (2) In the event that the Employer is of the opinion that the issues in such a dispute or difference will or may touch upon or concern a dispute or difference arising under out of or in connection with the Contract ("the Contract Dispute") then provided that an arbitrator has not already been appointed, the Employer may by notice in writing to the Designer require and the Designer shall be deemed to have consented to the referral of such dispute or difference to the arbitrator to whom the Contract Dispute has been or will be referred.

- (3) Save as expressly otherwise provided, the arbitrator shall have full power to open up, review and revise any decision, opinion, instruction, notice, order, direction, withholding of approval or consent, statement of objection, determination, certificate, assessment or valuation by the Employer's Representative or the Contractor, relating to the dispute or difference.

**IN WITNESS** whereof this Warranty has been executed as a deed on the date first before written.

THE COMMON SEAL of       )  
[Designer            ]       )  
was affixed hereto in    )  
the presence of:-        )

**Contract Form-7****Parent Company Undertaking**

THIS UNDERTAKING is issued on the \_\_\_\_\_ day of \_\_\_\_\_

BY \_\_\_\_\_ [whose registered office is at] / [of] \_\_\_\_\_ ("the Parent Company").

infavour of

Maharashtra Metro Rail Corporation Limited together with its successors and assigns, (the Employer"):

.....  
.....  
.....

**WHEREAS**

(A) By a Contract for \_\_\_\_\_ in respect of Pune Metro Rail Project

Contract No: MAHA-METRO/ \_\_\_\_\_ ("the Contract") made between

(1) Maharashtra Metro Rail Corporation Limited (the "Employer")

and

(2) \_\_\_\_\_ (the "Contractor") the Contractor has agreed to design, execute, complete and remedy any defects in the works ("the Works") upon the terms and conditions contained in the Contract.

(B) Pursuant to the terms of the Contract, the Contractor has agreed to procure the provision of an undertaking in the terms hereof.

(C) The Parent Company is the beneficial owner of \_\_\_\_\_ % [see Note 1] of the issued share capital of [the Contractor] [see Note 2].

(D) At the request of the Contractor, the Parent Company has agreed to provide this undertaking.

**NOW IT IS HEREBY UNDERTAKEN AND AGREED** as follows:

1. In consideration of the Employer entering into the Contract with the Contractor, the Parent Company hereby undertakes to the Employer that, without the written consent of the Employer, it will not [and will ensure that none of the companies referred to in Recital (C) will] [see Note 5]:

- a. Sell, transfer, assign or otherwise dispose of or deal with ownership of the whole or any part of EITHER [the share holding or other interest in the [Contractor] [see Note 3] OR [the share holdings or other interests] [see Note 4] referred to in Recital (C) in any way which will affect the beneficial ownership and control in [the Contractor] [see Note 3] of the Parent Company [and the other companies referred to in Recital (C)] [see Note 5]; and

- b. take any action which may result in the Contractor being unable to comply with its obligations or perform in any way its duties under the Contract [or take any action which may result in [the Member forming part of the Contractor] [see Note 3] being unable to comply with its obligations or perform in any way its duties under the [Consortium or other relevant] agreement] [see Note 6]

until such time as the Works shall have been completed, all the Contractor's obligations under the Contract shall have been performed and the Defects Liability Period (as defined in the Contract) for the whole and every part of the Works shall have elapsed and further that it will ensure [that the Member forming part of the Contractor will take all steps necessary to ensure [see Note 6] compliance by the Contractor with the provisions of the Contract.

2. The obligations of the Parent Company under this Undertaking shall remain in full force and effect and shall not be affected or discharged in any way and the Parent Company hereby waives notice of:
  - a. any suspension of the Works, variation or amendment to the Contract (including without limitation extension of time for performance) or any concession or waiver by the Employer in respect of the Contractor's obligations [and/or the obligations of [ \_\_\_\_\_ ] [see Note 7]
  - b. any provision of the Contract being or becoming illegal, invalid, void, voidable or unenforceable;
  - c. the termination of the Contract or of the employment of the Contractor and/or [ \_\_\_\_\_ ] [see Note 7] under the Contract for any reason;
  - d. any forbearance or waiver of any right of action or remedy the Employer may have against the Contractor [and/or [ \_\_\_\_\_ ]] [see Note 7] or negligence by the Employer in enforcing any such right of action or remedy;
  - e. any bond, undertaking, security or other guarantee held or obtained by the Employer for any of the obligations of the Contractor [and/or [ \_\_\_\_\_ ]] [see Note 7] under the Contract or any release or waiver thereof.
3. This Undertaking shall extend to any variation of or amendment to the Contract and to any agreement supplemental thereto agreed between the Employer and the Contractor [and/or [ \_\_\_\_\_ ]] [see Note 7] and for the avoidance of doubt the Parent Company hereby authorises the Employer and the Contractor [and/or [ \_\_\_\_\_ ]] [see Note 7] to make any such amendment, variation or supplemental agreement.
4. All documents arising out of or in connection with this Undertaking shall be served:
  - a. upon the Employer, at \_\_\_\_\_ marked for the attention of \_\_\_\_\_;
  - b. upon the Parent Company, at \_\_\_\_\_
5. The Employer and the Parent Company may change their respective nominated addresses for service of documents to another address but only by prior written notice to each other. All demands and notices must be in writing.
6. This Undertaking shall be governed by and construed according to the laws for the time being in force in India and the Parent Company agrees to submit to the exclusive jurisdiction of the courts at Pune, Maharashtra, India.

**IN WITNESS** where of this Undertaking has been executed as a deed on the date first before written.

Name:

Designation:

Date of Board resolution authorizing executant to execute this undertaking

Place:

**Notes:**

(For preparation of but not for inclusion in the engrossment of this Undertaking)

1. If the Parent Company is not the immediate parent company, the chain of ownership must be recited, identifying each company in the chain and the shareholdings or other interests in each subsidiary.
2. If the Contractor is a Consortium, that fact and the Consortium or other relevant agreement must be recited. In such case, insert the name of the Members of the Consortium in respect of which the parent company undertaking is being given. In such a case, the parent company of each of the Members is required to give the undertaking.
3. If Note 2 applies, refer to the Member relating to that Parent Company (which is giving this undertaking) and not the Contractor.
4. If Note 1 applies, use this alternative.
5. If Note 1 applies, add this provision.
6. If Note 2 applies, add this provision.
7. If Note 2 applies, add this provision and insert the name of the Member.
8. The notarized copy of the board resolution of the Parent Company must also accompany this Undertaking. In case the Parent Company is a foreign entity, then such board resolution should be notarized by a notary in its home country followed by the consularisation by the Indian Embassy there, or apostilised as per Hague Convention, as the case may be.

**Contract Form-8****Parent Company Guarantee**

THIS GUARANTEE is made the \_\_\_\_\_ day of \_\_\_\_\_

BY \_\_\_\_\_ whose registered office is at \_\_\_\_\_ [and \_\_\_\_\_ whose registered office is at \_\_\_\_\_] ("the Guarantor").

To Maharashtra Metro Rail Corporation Limited together with its successors and assigns, "the Employer") of:

.....  
.....  
.....

**WHEREAS**

(A) By a Contract for \_\_\_\_\_ of Pune Metro Rail Project

Contract No: \_\_\_\_\_ ("the Contract") made between

(1) Maharashtra Metro Rail Corporation Limited (the "Employer")

and

(2) \_\_\_\_\_ (the "Contractor") the Contractor has agreed to design, execute, complete and remedy any defects in the works ("the Works") upon the terms and conditions contained in the Contract.

(B) Pursuant to the terms of the Contract, the Contractor has agreed to procure the provision of a guarantee in the terms hereof. [see Note 1]

(C) At the request of the Contractor, the Guarantor has agreed to guarantee performance of the Contract by the [Contractor] [see Note 2] as set out herein.

**IT IS HEREBY AGREED AS FOLLOWS:**

1. In consideration of the Employer entering into the Contract with the Contractor, the Guarantor irrevocably and unconditionally guarantees to the Employer as a primary obligation and not as a surety due performance by the [Contractor] [see Note 2] of all of its obligations and liabilities under and in accordance with the Contract save that nothing herein shall be construed as imposing greater obligations or liabilities on the Guarantor than are imposed on the [Contractor] [see Note 2] in the Contract.
2. The obligations of the Guarantor under this Guarantee shall remain in full force and effect and shall not be affected or discharged in any way by and the Guarantor hereby waives notice of:
  - a. any suspension of the Works, variation to or amendment of the Contract (including without limitation extension of time for performance) or any concession or waiver by the Employer in respect of the Contractor's obligations [and/or the obligations of \_\_\_\_\_] [see Note 3] under the Contract;

- b. any provision of the Contract being or becoming illegal, invalid, void, voidable or unenforceable;
  - c. the termination of the Contract or of the engagement of the Contractor [ and / or \_\_\_\_\_ ] [see Note 3] under the Contract for any reason;
  - d. any forbearance or waiver of any right of action or remedy the Employer may have against the Contractor [ and / or \_\_\_\_\_ ] [see Note 3] or negligence by the Employer in enforcing any such right of action or remedy;
  - e. any bond, undertaking, security or other guarantee held or obtained by the Employer for any of the obligations of the Contractor [ and / or \_\_\_\_\_ ] [see Note 3] under the Contract or any release or waiver thereof.
3. This Guarantee shall extend to any variation of or amendment to the Contract and to any agreement supplemental thereto agreed between the Employer and the Contractor [and/or \_\_\_\_\_] [see Note 3] and for the avoidance of doubt the Guarantor hereby authorises the Employer and the Contractor [and/or \_\_\_\_\_] [see Note 3] to make any such amendment, variation or supplemental agreement.
4. This Guarantee is a continuing guarantee and accordingly shall cover all of the obligations and liabilities of the [Contractor] [see Note 2] under the Contract and remain in full force and effect until all the said obligations and liabilities of the Contractor shall have been carried out, completed and discharged in accordance with the Contract. This Guarantee is in addition to any other security which the Employer may at any time hold and may be enforced without first having recourse to any such security or taking any steps or proceedings against the Contractor.
5. Until expiry of the Defects Liability Period (as defined in the Contract) for the whole and every part of the Works, the Guarantor shall not on any ground whatsoever make any claim or threaten to make any claim whether by proceedings or otherwise against the Contractor [and/or \_\_\_\_\_] [see Note 3] for the recovery of any sum paid by the Guarantor pursuant to this Guarantee. Any such claim shall be subordinate to any claims (contingent or otherwise) which the Employer may have against the Contractor [and/or \_\_\_\_\_] [see Note 3] arising out of or in connection with the Contract until such time as such claims shall be satisfied by the Contractor [and/or \_\_\_\_\_] [see Note 3] or the Guarantor as the case may be. To that intent the Guarantor shall not claim or have the benefit of any security which the Employer holds or may hold for any monies or liabilities due or incurred by the Contractor [and/or \_\_\_\_\_] [see Note 3] to the Employer and, in case the Guarantor receives any sum from the Contractor [and/or \_\_\_\_\_] [see Note 3] in respect of any payment by the Guarantor hereunder, the Guarantor shall hold such sum in trust for the Employer for so long as any sum is payable (contingently or otherwise) under this Guarantee.
6. The Employer shall be entitled to assign the benefit of this Guarantee at any time without the consent of the Guarantor or the [Contractor] [see Note 2] being required.
7. All documents arising out of or in connection with this Guarantee shall be served:
- a. upon the Employer, at \_\_\_\_\_ marked for the attention of \_\_\_\_\_;
  - b. upon the Guarantor, at \_\_\_\_\_ India [see Note 5]
8. The Employer and the Guarantor may change their respective nominated addresses for service of documents to another address but only by prior written notice to each other. All demands and notices must be in writing.



9. This Guarantee shall be governed by and construed according to the laws for the time being in force in India and the Guarantor agrees to submit to the exclusive jurisdiction of the courts at Pune, Maharashtra, India.

IN WITNESS whereof this Guarantee has been executed as a deed on the date first before written

.....

Name:

Designation:

Date of Board resolution authorizing executant to execute this undertaking

Place:

**Notes:**

(For preparation of but not inclusion in the engrossment of this Guarantee)

1. If the Contractor is a Consortium, that fact and the Consortium or other relevant agreement and the relationship of the Guarantor to the concerned Members forming part of the Contractor must be recited.
2. If Note 1 applies, replace the word "Contractor" with name of the concerned Member of the Consortium being guaranteed.
3. If Note 1 applies, add additional wording and insert the name the concerned Member of the Consortium being guaranteed.
4. The notarized copy of the board resolution of the Guarantor must also accompany this Guarantee. In case the Guarantor is a foreign entity, then such board resolution should be notarized by a notary in its home country followed by the consularisation by the Indian Embassy there, or apostilised as per Hague Convention, as the case may be.
5. The address for service shall be in India.

**Contract Form-9****Contractor's Warranty**

**THIS WARRANTY** is made the \_\_\_\_\_ day of \_\_\_\_\_

BY \_\_\_\_\_ of \_\_\_\_\_ [and [see Note 1]] ([jointly] "the Contractor")

To Maharashtra Metro Rail Corporation Limited together with its successors and assigns, "the Employer") of:

.....  
.....  
.....

**WHEREAS**

(A) By a Contract for \_\_\_\_\_ of Pune Metro Rail Project

Contract No: ("the Contract") made between

(1) Maharashtra Metro Rail Corporation Limited (the "Employer")

and

(2) \_\_\_\_\_ (the "Contractor"), the Contractor has agreed to design, execute, complete, test and commission (including Integrated Testing and Commissioning) and remedy any defects in the works ("the Works") upon the terms and conditions contained in the Contract.

(B) [See Note 3].

(C) At the request of the Employer and pursuant to the terms of the Contract the Contractor has agreed to provide this Warranty.

**NOW IT IS AGREED AS FOLLOWS:**

1. The Contractor hereby warrants and undertakes that:

- a. the Contractor will design, execute, complete, test and commission (including Integrated Testing and Commissioning) and remedy any defect in the Works in accordance with the terms of the Contract; and
- b. the Contractor owes a duty of care to the Employer in relation to the performance of its duties under the Contract; and
- c. the Contractor will rectify or replace free of cost to the Employer any defect or failure of equipment provided in the Works for a period of 24 months from the date of taking over of section of the Works; and
- d. the Contractor agrees that should any modification be required to any part of the construction work as a consequence of failure analysis, the aforesaid period of 24 months shall re-commence from the date when the modified part is commissioned into service if the date of modification is later than the date of taking over of last trainset, and such modification shall be carried out free of cost to the Employer in all sections;

and

- e. the Contractor shall maintain the manufacture & supply of spares (including those of its Sub-Contractors / vendors) for the equipment supplied in the Contract-work for at least 5 years from the date of Completion of the Contract; and
  - f. the Contractor has exercised and will continue to exercise in the design of the Works all the skill and care to be expected of a professionally qualified and competent designer experienced in work of similar nature and scope as the Works; and
  - g. the Works will, when completed, comply in all respects with the Employer's Requirements, the Contractor's Technical Proposals, the final Design Document and the intended use of the Works; and
  - h. the Works has been or will be designed and manufactured to the highest standards available using internationally proven up-to-date good practice; and
  - i. the Works will, when completed, comply with enactments and regulations relevant to the Works; and
  - j. no Materials generally known to be deleterious or not in accordance with good engineering practice have been or will be specified or selected or incorporated in the Works by the Contractor.
2. The liability of [the companies comprising [see Note 3]] the Contractor under this Warranty [shall be joint and several and [see Note 3]] shall not be released, diminished or in any way affected by any independent inquiry or investigation into the Works or any matter related to the Contract whether carried out by or on behalf of the Employer or any liability or right of action which may arise out of such inquiry or investigation.
3. Insofar as the copyright or other intellectual property rights in any plans, calculations, drawings, documents, materials, plant, know-how and other information relating to the Works shall be vested in [the Contractor] [see Note 5], the [Contractor] [see Note 5] grants to the Employer its successors and assigns a royalty free, non-exclusive and irrevocable licence (carrying the right to grant sub-licences) to use and reproduce any of the works designs, inventions or other information incorporated and referred to in such documents or materials and any such know-how and information for all purposes relating to the Works of the Pune Metro Rail Project including without limitation the design, manufacture, installation, completion, testing and commissioning (including Integrated Testing and Commissioning) reinstatement, extension and the remedy of any defect in the Works. To the extent that beneficial ownership of any such copyright or other intellectual property rights is vested in anyone other than the [Contractor] [see Note 5], the [Contractor] [see Note 5], shall use best endeavours to procure that the beneficial owner thereof shall grant a like licence to the Employer. For the avoidance of doubt, any such licence granted shall not be determined if the [Contractor] [see Note 5], shall for any reason cease to be employed in connection with the Works.
4. The provisions of this Warranty shall be without prejudice to and shall not be deemed or construed so as to limit or exclude any rights or remedies which the Employer may have against the Contractor, whether in tort or otherwise.
5. Nothing contained in this Warranty shall vary or affect the Contractor's rights and obligations under the Contract.
6. The address for service of all documents arising out of or in connection with this Warranty

shall be:

a. Upon the Employer at:

.....  
.....  
.....

b. Upon the Contractor at \_\_\_\_\_ India. [Note 4]

7. The Employer and the Contractor may change their respective nominated addresses to another address in India but only by prior written notice to each other. All notices must be in writing.
8. This Warranty shall be governed by and construed according to the laws for the time being in force in India.
9.
  - (1) Any dispute or difference of any kind whatsoever between the Employer and the Contractor arising under out of or in connection with this Warranty shall be referred to arbitration in accordance with the provisions relating to 'Conciliation and Arbitration' as set out in the General Conditions of Contract. "Dispute" as defined in the Contract shall be deemed to include any such dispute or difference between the Employer and Contractor.
  - (2) In the event that the Employer is of the opinion that the issues in such a dispute or difference will or may touch upon or concern a dispute or difference arising under out of or in connection with the Contract ("the Contract Dispute") then provided that an arbitrator has not already been appointed pursuant to Clause 9(1), the Employer may by notice in writing to the Contractor require and the Contractor shall be deemed to have consented to the referral of such dispute or difference to the arbitrator to whom the Contract Dispute has been or will be referred.
  - (3) Save as expressly otherwise provided, the arbitrator shall have full power to open up, review and revise any decision, opinion, instruction, notice, order, direction, withholding of approval or consent, determination, certificate, statement of objections relating to the dispute.
  - (4) Subject to the foregoing provisions of this clause 9, the Employer and the Contractor agree to submit to the exclusive jurisdiction of the Courts of India at Pune.

IN WITNESS whereof this Warranty has been executed as a deed on the date written at the head hereof.

.....  
Name:

Designation:

Date of Board resolution authorizing executant to execute this undertaking

Place:

#### Notes:

(for preparation of and not inclusion in the engrossment of this Warranty)

1. If the Contractor is a Consortium,, each Member of such Consortium shall be a party and

liability under this warranty will be joint and several, with consequential grammatical changes.

2. If Note 1 applies, that fact and the Consortium or other relevant agreement must be recited.
3. Delete if Note 1 does not apply.
4. The address for service shall be in India.
5. If Note 1 applies, then insert the name of each Member.

**Contract Form-10****Sub-Contractor's / Vendor's Warranty**

(As applicable)

**THIS WARRANTY** is made the \_\_\_\_\_ day of \_\_\_\_\_

BY \_\_\_\_\_ [whose registered office is at] / [of] \_\_\_\_\_ ("the Sub-contractor") and

TO Maharashtra Metro Rail Corporation Limited together with its successors and assigns, "the Employer") of:

.....  
.....  
.....**WHEREAS**

(A) By a Contract for \_\_\_\_\_ of Pune Metro Rail Project

Contract No: ("the Contract") made between

(1) Maharashtra Metro Rail Corporation Limited (the "Employer")

and

(2) \_\_\_\_\_ (the "Contractor"), the Contractor has agreed to \_\_\_\_\_ and remedy any defects in the works ("the Works") upon the terms and conditions contained in the Contract.

(B) The Sub-contractor / vendor has had an opportunity of reading and noting the provisions of the Contract (other than details of the Contractor's prices and rates).

(C) Pursuant to the Contract, the Contractor wishes to enter into an agreement ("the Sub-contract") with the Sub-contractor / Vendor to carry out and complete a part of the Works as more particularly described in the Sub-contract ("the Sub-contract Works").

(D) The Contract stipulates that the Contractor shall obtain the consent of the Engineer before entering into the Sub-contract, and that the Contractor shall procure that the Sub-contractor executes a warranty in favour of the Employer.

**NOW IT IS HEREBY AGREED** as follows:

1. In consideration of the Engineer consenting to the Contractor and the Sub-contractor / Vendor entering into the Sub-contract, the Sub-contractor warrants and undertakes to the Employer that:

- a. he will execute and complete the sub-contracted Works / supply, and will carry out each and all of the obligations, duties and undertakings of the Sub-contractor / Vendor under the Sub-contract when and if such obligations, duties and undertakings shall become due and performable, in accordance with the terms of the Sub-contract (as the same may from time to time be varied or amended with the consent of the Employer); and

- b. he will supply to the Contractor and in specific cases wherever required to the Engineer with all information as may be required from time to time in relation to progress of the Sub-contract Works.
2. The Sub-contractor / Vendor undertakes to indemnify the Employer against each and every liability which the Employer may have to any person whatsoever and against any claims, demands, proceedings, loss, damages, costs and expenses sustained, incurred or payable by the Employer provided that the Sub-contractor / Vendor shall have no greater liability to the Employer by virtue of this Warranty than the liability of the Contractor to the Employer under the Contract insofar as and to the extent that the same has arisen by reason of the execution of the Sub-Contract or any breach by the Sub-contractor / Vendor of his obligations under the Sub-contract.
  3. No allowance/extension of time by the Employer hereunder or by the Contractor under the Sub-contract nor any forbearance or forgiveness in or in respect of any matter or thing concerning this Warranty or the Sub-contract on the part of the Employer or the Contractor, nor anything that the Employer or the Contractor may do or omit or neglect to do, shall in any way release the Sub-contractor / Vendor from any liability under this Warranty.
  4. The Sub-contractor / Vendor agrees that he will not without first giving the Employer not less than 21 day's prior notice in writing exercise any right he may have to terminate the Sub-contract or treat the same as having been repudiated by the Contractor or withhold performance of its obligations under the Sub-contract.
  5.
    - (1) In the event that the Contract or the employment of the Contractor under the Contract is terminated for any reason whatsoever and if so requested by the Employer in writing within 21 days of such termination, the Sub-contractor / Vendor shall carry out and complete his obligations under this Warranty and shall enter into a novation agreement with the Employer and the Contractor in which the Sub-contractor will undertake inter alia to perform the Sub-contract and be bound by its terms and conditions as if the Employer had originally been named as a contracting party in place of the Contractor. The said novation agreement will be in such form as the Employer may reasonably require.
    - (2) In the event that the Employer does not require the Sub-contractor / Vendor to enter into a novation agreement as required by Sub-clause 5 (1), the Sub-contractor shall have no claim whatsoever against the Employer for any damage, loss or expense howsoever arising out of or in connection with this Warranty.
  6. Insofar as the copyright or other intellectual property rights, in any plans, calculations, drawings, documents, materials, know-how and information relating to the Sub-contract Works shall be vested in the Sub-contractor / Vendor, the Sub-contractor / Vendor grants to the Employer, his successors and assignees a royalty free, non-exclusive and irrevocable licence (carrying the right to grant sub-licences) to use and reproduce any of the works designs, inventions or other information incorporated and referred to in such documents or materials and any such know-how and information for all purposes relating to the Works of the Pune Metro Rail Project, without limitation the design of enabling facilities, construction, installation, reconstruction, completion, reinstatement, extension, remedy of any defect of the Works. To the extent beneficial ownership of any such copyright or other intellectual property right is vested in anyone other than the Sub-contractor / Vendor, the Sub-contractor shall use best endeavours to procure that the beneficial owner thereof shall grant a like licence to the Employer. For the avoidance of doubt, any such licence granted shall not be determined if the Sub-contractor / Vendor shall for any reason cease to be employed in connection with the Sub-contract Works.

7. In the event of any ambiguity or conflict between the terms of the Sub-contract and this Warranty, the terms of this Warranty shall prevail.
8. The provisions of this Warranty shall be without prejudice to and shall not be deemed or construed so as to limit or exclude any rights or remedies which the Employer may have against the Sub-contractor / Vendor whether in tort or otherwise.
9. Nothing contained in this Warranty shall vary or affect the Sub-contractor's / Vendor's rights and obligations under the Sub-contract.
10. The Employer shall be entitled to assign the benefit of this Warranty at any time without the consent of the Sub-contractor / Vendor being required.
11. All documents arising out of or in connection with this Warranty shall be served:
  - a. Upon the Employer at:  
 .....  
 .....
  - b. Upon the Sub-Contractor / Vendor at \_\_\_\_\_ India.
12. The Employer and the Sub-contractor / Vendor may change their respective nominated addresses for service of documents to another address in India but only by prior written notice to each other. All demands and notices must be in writing.
13. This Warranty shall be governed by and construed according to the laws for the time being in force in India.
14.
  - (1) Any dispute or difference of any kind whatsoever between the Employer and the Sub-contractor / Vendor arising under out of or in connection with this Warranty shall be referred to arbitration in accordance with the arbitration provisions as described in the Contract.
  - (2) In the event that the Employer is of the opinion that the issues in such a dispute or difference will or may touch upon or concern a dispute or difference arising under out of or in connection with the Contract ("the Contract Dispute") then provided that an arbitrator has not already been appointed pursuant to Clause 14 (1), the Employer may by notice in writing to the Sub-contractor / Vendor require and the Sub-contractor / Vendor shall be deemed to have consented to the referral of such dispute or difference to the arbitrator to whom the Contract Dispute has been or will be referred.
  - (3) Save as expressly otherwise provided, the arbitrator shall have full power to open up, review and revise any decision, opinion, instruction, notice, order, direction, withholding of approval or consent, determination, certificate, statement of objection, assessment or valuation by the Engineer or the Contractor relating to the dispute or difference.
  - (4) Subject to the foregoing provisions of this clause 14, the Sub-Contractor agrees to submit to the exclusive jurisdiction of the Courts at Pune, Maharashtra.

IN WITNESS whereof this Warranty has been executed as a deed on the date first before written

.....



Name:

Designation:

Date of Board resolution authorizing executant to execute this undertaking

Place:

Note: The notarized copy of the board resolution of the Sub-Contractor/vendor must also accompany this Warranty. In case the Sub-Contractor/vendor is a foreign entity, then such board resolution should be notarized by a notary in its home country followed by the consularisation by the Indian Embassy there, or apostilised as per Hague Convention, as the case may be.

**Contract Form-11****Indemnity Bond**

THIS INDENTURE made on .....between .....(hereinafter called the Contractor) which expression shall where the context do admits or implies be deemed to include its executors, administrators and assigns of the one part and the Maharashtra Metro Rail Corporation Ltd. (hereinafter called Maha-Metro) of the other part.

WHEREAS by the agreement (LOA No ..... dated.....) (hereinafter called the said agreement) the contractor has agreed to “-----” and whereas the contractor has applied to the MAHA-METRO that they may be allowed advance on the security of materials absolutely belonging to them and brought by them to the site of the works covered under the project of the said agreement for use in the construction of such of the work as they have under taken to execute at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges).

AND WHEREAS the MAHA-METRO has agreed to make stage payment to the contractor the total sum of Rs.----- (Rupees -----only) for stage payment Bill. The quantities and other particulars of which are detailed in this bill for the said works signed by the Contractor on “-----” and MAHA-METRO has reserved to itself option of making any further advances till date on the security of other materials brought by the contractor to site of the said work.

NOW THIS INDENTURE WITNESS that in pursuance of the said agreement and its consideration of the sum of Rs. ----- (Rupees -----only) on or before the execution of these present amount paid to the contractor by the MAHA-METRO (the receipt where of the contractor) both hereby acknowledge and of such further Stage payment, if any, as may be made to him so aforesaid to the contractor do the covenant and agreed with the MAHA-METRO and declare as follows:

1. That the said sum of Rs. ----- (Rupees ----- only) so Stage Payment by the MAHA-METRO to the contractors as aforesaid and all or any further sum or sum's advanced as aforesaid shall be employed by the contractor in or towards the execution of the said works and for no other purpose whatsoever.
2. That the Stage Payment detailed in the said running account bill which have been offered to and accepted by the MAHA-METRO as security are absolutely the contractor's own property and free from encumbrances of any kind and the contractor's shall not make any application for or receive any further payments on the security of work executed which are not absolutely his own property and free from encumbrances of any kind the Contractor indemnifies the MAHA-METRO against all claims on any materials in respect of which any Stage Payment has been made to him as aforesaid.
3. That the Stage Payment detailed in the said running account bill and all other stage payments on the security of which further payments or Stage Payment any hereafter be made as aforesaid (hereinafter called the said materials) shall be used by the contractor solely in the execution of the said works in accordance with the directions of the Engineer / MAHA-METRO and in the terms of the said agreement.
4. That the contractor shall be fully liable for the materials/components and shall make at his own cost all necessary and adequate arrangement for the proper watch, safe custody and protection against all risks including, acts of the God of the said materials/components

and provide on approved insurance in favour of MAHA-METRO that until used in construction as aforesaid the said materials shall remain at the site of said works in the contractor's custody and on his own responsibility and shall at the time be open to inspection by the Engineer/MAHA-METRO. This insurance will be valid for a period until this material is approved and fixed in the building or advance has been fully recovered from contractor.

5. That the said materials/components shall not on any account be removed/shifted from the site of the works except with the written permission of the Engineer/MAHA-METRO.
6. That issue of any Stage Payment excess of what is finally required to be used at site would be the contractor's property without any liability on MAHA-METRO., who would recover the cost of this from the contractor.
7. That the contractor hereby charges all the said materials components with the repayment to the MAHA-METRO of the said sum of Rs. ----- (Rupees ---- -----only) and any further sum or sums advanced as aforesaid and all cost charges. Damages and expenses payable under these presents provided always and it is hereby agreed and declared that not with power contained therein, if any, whenever the convenient for payment, and repayment herein before contained shall become enforceable and the money owned shall not be paid in accordance therewith, the MAHA-METRO., may at any time thereafter adopt all or any of the following courses as he may deem best.
  - a. That if the contractor shall at any time not be able to complete any part of the Component / equipment as per provision in contract Agreement it shall be considered as the work being left incomplete by the contractor and action as per the conditions of the contract shall be taken.
  - b. Deduct all or any of the money owing out of the performance security or any sum due to the contractor under the said agreement.

That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail.

This widening shall be co-extensive to the agreement dated ..... between Maharashtra Metro Rail Corporation Limited, \_\_\_\_\_. (Client) and .....(Contractor).

IN WITNESS where of the said contractor and by the order under the direction of MAHA-METRO has here set their respective hands the day and years first above written.

Signed, Sealed & Delivered by the said Contractor:

IN THE PRESENCE OF: WITNESS:

1. NAME:       Signature:

SIGNED BY (ADDRESS)

BY THE ORDER AND DIRECTION OF THE MAHA-METRO IN THE PRESENCE OF:

SIGNATURE: WITNESS

(NAME AND ADDRESS)

**Contract Form-12****Guarantee for Safe Custody**

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

To:

MAHARASHTRA METRO RAIL CORPORATION LIMITED,

\_\_\_\_\_

\_\_\_\_\_

WHEREAS – the Consortium/ Joint venture consisting of:

(Name of Lead Member of the Group and address)

(Name of Member of the Group and address)

(Name of Member of the Group and address) [SEP]

(hereinafter called “the Contractor”), with M/s----- as the lead member has undertaken, in pursuance of Contract No. [ ] dated .....for [Note 4] (hereinafter called “the Contract”), [SEP] AND WHEREAS according to the said Contract the Employer is obliged to pay to the Contractor the sum of [ ] ([ ]) (“the Payment on delivery”) as set out in the priced Bill of Quantities.

(A) Pursuant to the said activities, [Note 4] are to be manufactured offshore or in India for subsequent delivery to the Contractor’s premises in Pune, India and held in safe custody by the Contractor.

(B) Pursuant to the terms of the Contract, the Contractor, as a condition precedent to his entitlement to receive any payment for items including an element of [Note 4] Contract [ ] to the Contractor’s premises in Pune, is obliged to provide a Guarantee in the terms hereof for 95 percent of the Payment. [SEP]

AND WHEREAS we (Insert name and address of scheduled commercial bank based in India) 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.

1. We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.
2. 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 there under 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.
3. The Bank shall pay to the Employer the amount thus demanded without requiring further evidence or proof of:

- a. the default of the Contractor; or
  - b. the Employer's entitlement to terminate the Contract or the employment of the Contractor under the Contract; or
  - c. any termination of the Contract or the employment of the Contractor under the contract; or
  - d. of the amount due and payable under this bank Guarantee.
4. The liability of the Bank under this Guarantee shall remain in full force and effect and shall not be affected or discharged in any way by and the Bank hereby waives notice of:
- a. any suspension of the Works, variation to or amendment of the Contract (including without limitation extension of time for performance or adjustment to the Tender Total or other payment under the Contract) or any concession or waiver by the Employer in respect of the Contractor's obligations under the Contract;
  - b. the termination of the Contract or of the employment of the Contractor under the Contract solely as a result of default by the Contractor under the Contract;
  - c. any forbearance or waiver of any right of action or remedy the Employer may have against the Contractor or negligence by the Employer in enforcing any such right of action or remedy;
  - d. any other security or guarantee held or obtained by the Employer for any of the obligations of the Contractor under the Contract or any release or waiver thereof;
  - e. any act or omission of the Contractor pursuant to any other arrangement with the Surety.
5. The liability of the Bank under this Guarantee shall cease on whichever of the following events first occurs:
- a. payment by the Bank of the Guaranteed Sum in full to the Employer; or
  - b. receipt of written notification from the Employer that the [Note 4] have been installed and tested to the satisfaction of the Employer.
6. Until the MAHA-METRO has issued an instruction to the Bank to the effect that this Guarantee can be released, the Bank undertakes to extend the validity under the same conditions for successive periods of six (6) calendar months at a time and to forward the appropriate extension sheets to the MAHA-METRO.

**SIGNATURE AND SEAL OF THE GUARANTOR**

-----  
 NAME OF THE BANK-----  
 ADDRESS-----  
 DATE-----

**Notes:**

1. The stamp papers of appropriate value shall be purchased in the name of the Bank, who issues the 'Bank Guarantee'.
2. The Bank Guarantee shall be from a scheduled commercial bank based in India, acceptable to the Employer.
3. The amount payable under this Guarantee shall be 95 percent of the aggregate of the installments of the Payment made to the Contractor prior to the date of the written demand referred to above less the aggregate of any sums in respect of items installed,

tested and certified by the Employer's Representative (as defined in the Contract) in accordance with the terms of the Contract.

4. Enter name of the Contract.

**Form- 13****Undertaking**  
**(Pertaining to engagement of Sub Contract)**

Contract no./Tender No.

Name of work .....

In connection with above work, M/s ..... , Contractor has/is engaging M/s ..... , as sub-contractor (material / equipment supplier or service provider). For this, the terms and conditions of agreement between Contractor & Sub-contractor, include necessary provisions for resolution of dispute if any arising between Contractor and subcontractor.

It is confirmed by the subcontractor that any payment/claim/dispute arising out of the above work shall be resolved in terms of agreement and shall not be raised before Employer and also shall not make any claim against Employer before any forum/court.

SIGNATURE AND SEAL OF THE CONTRACTOR

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(PUNE METRO RAIL PROJECT, PHASE-1 Extension)**

**BID DOCUMENTS**

**FOR**

**Name of work:**

Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**Tender No. P1Misc-32/2024**

**PART 3:**  
**CONDITIONS OF CONTRACT AND CONTRACT FORMS**  
**Section XI: SHE Manual**



**Maharashtra Metro Rail Corporation Limited**

Civil Court Metro Station, Nyayamurti Ranade Path, Pune-  
411005, Maharashtra, INDIA

E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)



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## **PART I: SHE MANAGEMNT**

### **1.0 GENERAL**

#### **1.1 Scope**

- 1.1.1 This document defines the principal requirements of the Employer on Safety, Health, and Environment (SHE) associated with the Contractor / sub-contractor and any other agency to be practiced at construction worksites at all time.

#### **1.2 Definition / languages**

- 1.2.1 The Environmental Quality Management Manual (EQM) forms an essential part of the overall Environmental Protection System employed by Maha-Metro for the construction of Pune Metro Rail Project.

##### **1.2.2 Definition & Abbreviations**

- a) **“Environment”** means the total surroundings of an organism including water, air and land and other living creatures.
- b) **“Environmental Pollutant”** means any solid, liquid or gaseous substance present in such concentration as may be or tend to be injurious to environment.
- c) **“Environmental Pollution”** means the presence in the environment of any environmental pollutant.
- d) **“Nuisance”** is annoyance, which results from any construction activity that affects the material comfort and quality of life of the inhabitants of the area surrounding the construction site.
- e) **“Monitoring”** is the use of direct or indirect reading field instrumentation to provide information regarding the levels of pollutants released during construction.
- f) **“Construction Site”** is the contract limits for construction. It shall be all the area within the limits of the work as shown on the Plans. Construction Site shall also include staging, and debris disposal areas and transportation routes to and from these areas.
- g) **“Noise”** is any unwanted sound disturbance of the environment around the area of construction operations.
- h) **“Decibel”** is a measure on a logarithmic scale of the magnitude of a particular quantity (such as sound pressure, sound power) with respect to a standardized reference quantity.
- i) **“A - weighted Noise levels”** in Decibels (referenced to 20 micro-Pascal) as measured with A-weighting network of standard sound level meter, abbreviated dB (A).
- j) **“Energy Equivalent Level ( $L_{eq}$ )”** is the level of a steady noise which has the same energy as the fluctuating noise level integrated over the period of measurement.  $L_{max}$  is the maximum Noise Level during the period of measurement.  $L_{10}$  and  $L_{90}$  are the percentile exceeding levels of sound which is exceeded 10% and 90% of the time of measurement.
- k) **“Waste”** is unwanted surplus substance arising from the application of all construction operations and any substance or article, which is required to be disposed.

- l) **“Suspended Particulate Matter”** is abbreviated as SPM and measured in  $\mu\text{g}/\text{m}^3$ .
- m) **“Environmental Quality Management Manual”** is abbreviated as **EQM**.
- n) **“Air Monitoring and Control Plan”** is abbreviated as **AMCP**.
- o) **“Noise Monitoring and Control Plan”** is abbreviated as **NMCP**.
- p) **“Ministry of Environment and Forests, Government of India”** is abbreviated as **MOEF**.
- q) **“Central Pollution Control Board”** is abbreviated as **CPCB**.
- r) Notwithstanding the definition of “Site” of Clause 1.1.6.7 of the GCC and in the context of the present specification the ESHS specifications, the word “Worksite(s)” means: The land where work will be carried out, or
  - i. the land necessary for the implantation of Worksite facilities (work camp, workshops, offices, storage areas, concrete production plants) and including special access roads, or
  - ii. quarries for aggregates, rock material and riprap, or
  - iii. borrow areas for sand and other selected material, or
  - iv. stockpiling areas for backfill material or other demolition rubble, or
  - v. any other location, specifically designated in the Contract as a Worksite

The term « Worksite(s) » encompasses any individual Worksite or all Worksites.

### 1.2.3 In this document:

- i. The use of **“shall”** indicates a mandatory requirement.
- ii. The use of **“should”** indicates a guideline that is strongly recommended.
- iii. The use of **“may”** indicates a guideline that is to be considered.
- iv. **“SHE”** means Safety, Health, and Environment.
- v. **“Employer”** means Maharashtra Metro Rail Corporation Limited or Maha-Metro
- vi. **“Chief Safety Officer”** means an officer nominated by Maha-Metro who is overall responsible for monitoring all SHE functions prescribed in this document.
- vii. **“BOCWA”** means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996
- viii. **“BOCWR”** means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998
- ix. **“DG”** means Director General of Ministry of Labour, Govt. of India.
- x. **“BOCWWCA”** means Building and Other Construction Workers’ Welfare Cess Act, 1996
- xi. **“BOCWWCR”** means Building and Other Construction Workers Welfare Cess Rules 1998
- xii. **“MBOCWR”** means Maharashtra Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2003
- xiii. **“Notifications”** (Central and state) – collection of cesses.

xiv. “**CIIBC**” means Chief Inspector of Inspection of Building and Other Constructions of Government of Maharashtra

xv. “**HIRA**” means Hazard Identification and Risk Assessment

### 1.3 Application of this document

1.3.1 This document applies to all aspects of the Contractor’s scope of work, including all aspects conducted by sub-contractors and all other agencies. There shall be no activity associated to the Contract, which is exempted from the purview of this document.

Pursuant to Clause 4.4 of the GCC, the Contractor is fully liable for all actions, non-compliance and negligence by subcontractors, their representatives, employees, and workers, to the same degree as it would be held liable for its own actions, non-compliance or negligence or that of its own representatives, employees or workers.

1.3.2 The present SHS specifications apply to the Contractor and unless explicitly agreed with the engineer, all subcontractors used for the execution of the works. Pursuant to Clause 4.4 of the GCC, the Contractor is fully liable for all actions, non-compliance and negligence by subcontractors, their representatives, employees and workers, to the same degree as it would be held liable for its own actions, non-compliance or negligence or that of its own representatives, employees or workers.

1.3.3 “The SHE specifications refer to:

- a) Protection of the natural environment (water, air, soil, vegetation, biological diversity) in areas adjacent to the Worksite, access roads, quarries, borrow areas, stockpiling of backfill material, labour camps or storage areas,
- b) Health and safety conditions to be maintained for the Contractor’s personnel and any other person present on the Worksites, or along access routes,
- c) Working practices and the protection of people and populations living near the Worksite, but exposed to the general disturbance caused by works

### 1.4 Purpose of this document

1.4.1 The objective of these guidelines is to ensure that adequate precautions are taken to avoid accidents, occupational illness, and harmful effects on the environment during construction.

1.4.2 This document:

- i. Describes the SHE interfaces between Employer and the Contractor
- ii. Details the processes by which the Contractor shall manage SHE issues while carrying out the work under the Contract.
- iii. Describes by reference, the practices and procedures as given in the Maha-Metro Project Safety, Health & Environment Manual for best SHE performance.

1.4.3 These requirements shall be read together with **Maha-Metro’s Project SHE Manual** as amended/revised time to time and all amendments/revisions during the execution of the work shall also be applicable, **ISO 45001-2018** Occupational Health and Safety Management System and **ISO 14001: 2015** Environmental Management Systems. Definition of key terms used in these requirements related to **ISO 45001-2018** and **ISO 14001:2015** standards are found in Maha-Metro’s Project SHE Manual.

## 2.0 ‘SHE’ TARGETS AND GOALS

2.1 The SHE targets, goals and aim for the Works are to achieve:

- (i) Zero total recordable injuries.
- (ii) Zero reportable environmental incidents
- (iii) All personnel inducted in accordance with the approved contractor's SHE plan.
- (iv) Total compliance of conducting inspections and audits as per approved SHE plan
- (v) 100% incident recording and reporting
- (vi) 100% adherence of usage of appropriate PPEs at work
- (vii) Executing construction work with least disturbance to the environment, adjoining road users and traffic.

### 3.0 COMPLIANCE

#### 3.1 Memorandum of Understanding (MOU)

- 3.1.1 A Memorandum of Understanding placed at Appendix No. 1 shall be executed before the award of Contract by the Contractor with regard to various provisions on Safety, Health, and Environment to be practiced during the construction work.

#### 3.2 Maha-Metro's SHE Policy and Management Systems

- 3.2.1 The construction works shall be undertaken in accordance with Maha-Metro's SHE Policy and Management Systems as amended from time to time provided in Project, SHE Manual.

#### 3.3 Indian statutory requirements

##### 3.3.1 Primary statutory regulations

- 3.3.1.1 Contractor shall develop thorough understanding about Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, Central Rules 1998, The Building & Other Construction Workers Welfare Cess Act 1996 and Central Welfare Rules 1998, Maharashtra Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2003, Building and Other Construction Workers Welfare Cess act 1996 and Central Rules 1998, Notification [Central & State] – Collection of Cess, not only to satisfy the Inspectors' perspective but the use of legislation as the strong tool for effective SHE management at construction worksites. Contractor is strongly advised to practice the principle of voluntary compliance.

- 3.3.1.2 In order to facilitate the Contractor for better understanding on the various provisions of the above Act and Rules, a tabulated information highlighting the Sections/Rules referring to the corresponding registration of Contractors, maintenance of registers and records, hours of work and wages, cess & welfare, medical facilities, and safety requirements are given in Appendix No. 2. It is an indicative one and not a limiting list.

- 3.3.2 In addition, the construction works shall be undertaken in accordance with all applicable legislation and Indian statutory requirements listed below but not limiting to:

(i)	Indian Electricity Act 2003 and Rules 1956 and its amendments
(ii)	National Building Code, 2005 and its amendments
(iii)	Factories Act, 1948, Maharashtra Government Factories Rules, 1963 and its amendments
(iv)	Motor Vehicles Act as amended in 1994 and The Central Motor Vehicles Rules, 1989
(v)	The Motor Transport Workers Act 1961 & Maharashtra Rules 1965 and its amendments
(vi)	Indian Road Congress Code IRC: SP: 55-2001 'Guidelines on Safety in Road Construction Zones'
(vii)	The Petroleum Act, 1934 and Rules 1976 and its amendments

- (viii) Gas Cylinder Rules, 2003 and its amendments
- (ix) Indian Explosives Act, 1884, along with the Explosives Substance Act 1908 and the Explosives Rules 1983
- (x) The (Indian) Boilers Act, 1923 and its amendments
- (xi) The Public Liability Insurance Act 1991 and Rules 1991 and its amendments
- (xii) Minimum Wages Act, 1948 and The Minimum Wages (Maharashtra Rules) 1961 and its amendments
- (xiii) The Contract Labour (Regulation & Abolition) Act 1970 & The Contract Labour (P&R) (Maharashtra) Rules, 1972 and its amendments
- (xiv) The Child Labour (Prohibition & regulation) Act 1986 and Maharashtra Rules 1994 and its amendments
- (xv) Environment Protection Act, 1986 and Rules 1986 and its amendments
- (xvi) Air (Prevention and control of Pollution) Act, 1981 and its amendments
- (xvii) Water (Prevention and Control of Pollution) Act, 1974 and its amendments
- (xviii) The Noise Pollution (Regulation & Control) Rules, 2000 and its amendments
- (xix) The Maharashtra (Urban Areas) Preservation of Trees Act, 1975 and its amendments
- (xx) Notification on Control of Noise from Diesel Generator (DG) sets, 2002 and its amendments
- (xxi) Recycled Plastic Usage Rules, 1998 and its amendments
- (xxii) Notification, Central Ground Water Board, Act January 1997 and its amendments
- (xxiii) The Manufacturing, Storage, and Import of Hazardous Chemical Rules, 1989 and its amendments
- (xxiv) Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 and its amendments
- (xxv) The Hazardous Waste (Management, Handling & Trans-boundary Movement) Rules, 2007 and its amendments
- (xxvi) Relevant Rules / Guidelines regarding Preservation of Trees
- (xxvi) Batteries (Management and Handling) Rules and its amendments
- (xxvi) Fly ash utilization notification, Sept 1999 as amended in August 2003 and its amendments
- (xxix) Guidelines of Pune Urban Development Authority
- (xxx) Guidelines of Maharashtra Pollution Control Board

Further, Contractor shall apply and take various clearances from the concerned agencies as presented in Table below: These clearances are indicative and contractor is required to take any other clearance as required for its construction activities.

**Table: Key Clearance Required**

Permission/ Clearance/Permit	Relevant Acts/Rules	Concerned Agency
Consent to Establish and Consent to Operate batching plants, casting yards, grouting plant, Hot Mix plant, if any	<ul style="list-style-type: none"> <li>• The Water (Prevention and Control of Pollution) Act, 1974, amended 1988 and</li> <li>• The Air (Prevention and Control of Pollution) Act 1981, amended 1987</li> </ul>	Maharashtra Pollution Control Board (MPCB)

Authorization for generation, handling, storage and transportation hazardous waste	Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016 and its amendments	Maharashtra Pollution Control Board (MPCB)
Permission for extraction of ground water	Environment (Protection) Act, 1986/Central Ground Water Authority guidelines	Central Ground Water Authority
Pollution Under Control Certificate	Central Motor and Vehicle Act 1988 Vehicular Exhaust Norms, CPCB 2007	Department of Transport, Maharashtra
C&D Waste Management Plan	Construction & Demolition Waste Management Rules, 2016	Local Authority (Municipal Corporation)



### 3.3.3 Workman Compensation Act, 1923 along with allied Rules

The Contractor shall ensure that all his employees / workmen are covered under 'Workmen Compensation Act' and shall pay compensation to his workmen as and when the eventuality for the same arises.

### 3.3.4 Notwithstanding the above Act/Rules, there is nothing in those to exempt the Contractor from the purview of any other Act or Rule in Republic of India for the safety of men and materials.

### 3.3.5 If the requirements stated in this document are less stringent than or in conflict with the country's applicable legislation, the latter shall apply.

## 3.4 International Standards, Guidelines & ISO Certifications

### 3.4.1 The Contractor complies with norms, standards and discharge limit values recommended by the specialised international organisations affiliated to the United Nations, as described in relevant clause below.

### 3.4.2 The specialised international organisations affiliated to the United Nations referred in relevant clause include:

- World Bank, including the IFC and its Environmental, Health and Safety guidelines available from <http://www.ifc.org/ehsguidelines>

For matters not addressed in the IFC above document, the norms, standards, and discharge limit values of the following institutions shall apply:

- World Health Organization (WHO)
- International Labour Organization (ILO) (in particular in pursuance to Clauses 6.20, 6.21, 6.23 and 6.24 of the GCC)
- International Maritime Organization (IMO)

### 3.4.3 The works should be undertaken in accordance with the applicable international guidelines, standards and specifications on SHE and every contract shall aim to achieve ISO certifications listed below during the currency of the contract:

**ISO 45001-2018** : Occupational Health and Safety Management System.  
**ISO 14001-2015** : Environmental Management Systems.

### 3.4.4 The process of certification shall start immediately after the award of the work and to be completed within 4 months' timeline. Towards this, the Contractor shall undertake the required steps including appointment of ISO consultant for obtaining the certification on Occupational Health and Safety Management System and Environment Management System. The certification shall be maintained throughout the currency of the contract.

### 3.1 In case of failure on the part of the Contractor, the Employer at the cost of the Contractor shall do the same.

## 3.5 Method Statement and Risk Assessment

### 3.5.1 Method Statement should be submitted by the Contractor. The Method Statement should include activity list, job step, equipment list, HIRA (Hazard Identification and Risk Assessment) etc.

### 3.5.2 Method statements shall be submitted to the Engineer **Twenty-One (21)** days prior to commencement of task.

3.5.3 Method statements shall incorporate control measures within the process methodology as identified within the risk assessment.

3.5.4 Risk Assessment should be work-site and Situation specific; a Generic format shall not be acceptable.

### **3.5.5 Risk Register & Hazard Log**

(i) A proper record of monitoring and control of Risk Assessment and appropriate control measures shall be maintained at site, which shall be produced when asked for.

(ii) All applicable Method Statement and Standard Operating Procedure confirming to the work and site requirement is an essential control measure. The contractor shall ensure submission of Method Statement along with applicable requisite procedures as part of SHE Plan well in advance as mentioned herein before commencement of work. The Hazard Log with Risk Assessment shall identify future method statement and operational procedures pertaining to specific equipment, operations, and local environmental constraints. OHS&E Plans for execution of work, shall not be accepted without the completed Hazard Log and Risk Register.

## **4.0 CONTRACTOR ENVIRONMENT HEALTH AND SAFETY POLICY AND PLAN**

4.1 The contractor as per rule 39 of the BOCW central rule shall formulate a Safety & Health policy in line with Maha-Metro's policies and display it at conspicuous places at work sites in Hindi and a local language understood by the majority of construction workers. The policy shall contain the following as minimum coverage:

- i. The intention and commitments of the establishment regarding health, safety and environment protection of the workers
- ii. Organisational arrangement made to carry out the policy specifying the responsibilities at different levels of hierarchy
- iii. Responsibilities of the contractors, sub-contractor, transporter or other agencies involved in the construction work
- iv. Techniques and methods for assessment of risk to safety and health and remedial measures
- v. Arrangement for training of works, supervisors or other persons engaged in the construction work
- vi. Other arrangement for making the policy more effective

4.2 Contractor shall revise the policy whenever any modification having implication on the safety and health of the workers is made or any new construction work, substances, or technique are introduced which have implication on health, safety of workers

4.3 Within Eight weeks from date of contract agreement, the Contractor shall submit a detailed and comprehensive Contract specific site Safety & Health Plan. The Safety & Health Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance of the contract provisions as well as statutory regulations. The Safety & Health Plan shall include the following but not be restricted to:

- I. A statement of the Contractor's policy, organization and arrangements for Safety & Health
- II. The name(s) and experience of person(s) within the Contractor's proposed management who shall be responsible for coordinating and monitoring the Contractor's Safety & Health performance;

- III. The number of Safety & Health staff who shall be employed on the Works, their responsibilities, authority and line of communication with the proposed Contractor's agent;
  - IV. A statement of the Contractor's policy and procedures for identifying and estimating hazards, and the measures for addressing the same;
  - V. A list of Safety & Health hazards anticipated for this Contract and sufficient information to demonstrate the Contractor's proposals for achieving effective and efficient health and safety procedures;
  - VI. A description of the Safety & Health training courses and emergency drills which shall be provided by the Contractor, with an outline of the syllabus to be followed;
  - VII. Details of the safety equipment which shall be provided by the Contractor, including personal protective equipment;
  - VIII. A statement of the Contractor's policy and procedures for ensuring that Contractor's Equipment used on the Project Site are maintained in a safe condition and are operated in a safe manner;
  - IX. A statement of the Contractor's policy and procedures for ensuring that sub- contractors comply with the Contractor's safety plan;
  - X. A statement of the Contractor's disciplinary procedures with respect to Safety & Health related matters;
  - XI. A statement of the Contractor's procedure for reporting and investigating accidents, dangerous occurrences or occupational illnesses;
  - XII. Detailed Standard Operating Procedures (SOP)/Safe Work Procedures (SWP) for every activity likely to be undertaken as well as for use and maintenance of Plant, Machines & Equipment shall be made as part of Safety & Health Plan;
  - XIII. Contract shall formulate format like work permit etc. and made checklist for activity involving risk as well as for using plant & machines/equipment's.
- 4.4 The Contractor shall formulate an Environment Policy in line with Maha-Metro Environment and other policies and display it at conspicuous places at work sites in Hindi and a local language understood by the majority of construction workers.
- 4.5 Within Eight weeks of the notification of acceptance of the tender, contractor shall submit a detailed and comprehensive contract specific site Environmental Plan. The Environment Plan shall include detailed policies, procedures and regulations which, then implemented, will ensure compliance of the contract provisions.
- 4.6 The site Environment Plan shall include the following but not be restricted to:

- (i) Within the period defined above, the contractor shall submit a draft contract specific Site Environment Plan for the approval of the Maha-Metro/Engineer and a final version prior to the commencement of the works.
- (ii) The site Environment Plan shall provide details of the means (as elaborated in Point No. 3 below) by which the contractor (and all sub-contractors working for the contractor) will implement the recommended mitigation measures and achieve the environmental performance standards defined both in Indian environmental legislation and in this document.
- (iii) The contract specific Site Environmental Plan will contain details of manpower required for environment related works, description of all procedures developed to meet the requirement defined in various sections of this document, to control environment pollution and organizational hierarchy for the effective implementation of the plan. Elements of the plan must address the management of pollution, the monitoring programme and the reporting requirements.
- (iv) Outline of the Site Environmental Plan is given below:

S. No.	SITE ENVIRONMENTAL PLAN OUTLINE
<b>1</b>	<b>GENERAL</b>
(i)	The Environmental Policy of the Contractor is clearly defined in the Site Environmental Plan, which, inter-alia, commits the Contractor to follow national and state environmental legislation and regulations.
(ii)	The person responsible for day-to-day environmental matters is identified and vested with authority to execute the Site Environmental Plan. The Contractor has environmental lines of communication.
(iii)	Procedure is available for Contractor's system of enforcing good environmental practices of its Sub-contractor. By procedure it is implied that the Sub Contractor has been given clear written directions to comply with all requirements mentioned in this document and as applicable.
(iv)	The Site Environmental Plan contains procedures for screening material used in the contract, for their environmental friendliness. This implies that the procedure will comply with MC2 and MC 3 credits of IGBC Green Mass Rapid System (MRTS).
<b>2</b>	<b>ENVIRONMENT FRIENDLY CONSTRUCTION PRACTICES</b>
(i)	The Site Environmental Plan shall contain specific procedures for achieving environmental performance requirements as given in the Employer's requirements on Environment.
(ii)	Procedures for carrying out Aspect/Impact analysis of contractor's proposed works and their effect on environment. This will be cross reference with ISO 14001:2015 (EMS) procedures.
(iii)	Procedures for setting up Objectives and Targets commensurate with Employer's requirement on Environment and how these shall be met.

(iv)	Procedures for formulating Environmental Management Plans and Operational Control Procedures to meet contractual requirements.
(v)	Procedures for offering environmental training and methods for promoting environmental awareness amongst his employees.
(vi)	The Site Environmental Plan must contain details on Air Monitoring and Control Plan which details Mitigation measures / Corrective Action / Preventive Action and Monitoring Schedule.
(vii)	The Site Environmental Plan must contain details on Noise Monitoring and Control Plan which details Mitigation measures / Corrective Action / Preventive Action and Monitoring Schedule.
(viii)	The Site Environmental Plan must contain procedures on prevention and control of water pollution from sanitary surface runoff and process wastewater.
(ix)	The Site Environmental Plan must contain details on procedures for Storage, handling and disposal of waste including, Municipal, C&D, Plastic, Bio-Medical, Chemical and Hazardous wastes.
(x)	The Site Environmental Plan must contain procedures for reuse/recycle of waste, selling to authorized recyclers and records thereof.
(xi)	The Site Environmental Plan must contain procedures for preservation of landscape disturbed due to construction, housekeeping/Environmental Sanitation and traffic management as required under the contract.
(xii)	The Site Environmental Plan must contain procedures for dealing with unforeseen environmental situations under Environmental Emergency.
<b>3</b>	<b>MONITORING, AUDITS AND RECORDS</b>
(i)	The Site Environmental Plan shall contain the environmental monitoring requirements as per the contract requirements.
(ii)	The Contractor keeps records of environmental monitoring and the Site Environmental Plan must contain provision for reporting results of environmental monitoring in a manner as specified in this document.
(iii)	The Site Environmental Plan must contain procedures for carrying out inspections
(iv)	The Site Environmental Plan must contain provisions for submitting monthly Environmental Management reports.
(v)	The Site Environmental Plan must contain procedures for recording environmental complaints and response process.

- 4.7 The Contractor shall, from time to time and as necessary as required by the Employer to produce supplements to the Safety & Health and Environment Plans such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety industrial health, responsibilities, policies and procedures relating to work on Site. Any and all submissions of supplements to the Safety & Health and Environment Plans shall be made to the Employer in accordance with the agreed procedures.

- 4.8 If at any time the Safety & Health and Environment plans is, in the Employer's opinion, insufficient or requires revision or modification to ensure the security of the Works and the safety, health and welfare of all workmen upon and visitors to the Site, the Employer may instruct the Contractor to revise the Safety & Health and Environment plans and the Contractor shall within 7 days submit the revised plan to the Employer for review.
- 4.9 Any omissions, inconsistencies and errors in the Safety & Health and Environment Plans or the Employer's acceptance or rejection of the Safety & Health and Environment Plans and/or supplements thereto shall be without prejudice to the Contractor's obligations with respect to site safety, industrial health and environment and shall not excuse any failure by the contractor to adopt proper and recognized safety and environmental practices throughout the execution of the Work.
- 4.10 The Contractor shall adhere to the Safety & Health and Environment Plans and shall ensure, as far as practically possible, that all sub-contractors of all tiers require that contracting parties each have a copy of the Site Safety & Health and Environment Plans and comply with its provisions.
- 4.11 The details of contents to be covered in the site Health & Safety Plan are given in Appendix No. 3.

## **5.0 DESIGNER'S ROLE**

### **5.1 Designer's role in Safety, Health, and Environment**

Designer's primary role includes to minimise the risk to Environment, health and safety of those who are going to construct, maintain, clean, repair, dismantle or demolish the structures and anyone else like adjoining road users/general public, who might be affected by the work.

### **5.2 General Philosophy**

When considering health and safety in designer's work, they shall be expected to do what is reasonable at the time the design is prepared. It may be possible for hazards, which cannot be addressed at the feasibility stage to be looked at during detailed design. In deciding what is reasonably practicable, the risk to health and safety produced by a feature of the design has to be weighed against the cost of excluding the feature. The overall design process does not need to be dominated by a concern to avoid all risks during the construction phase and maintenance. However, a judgement has to be made by weighing up one consideration against another so the cost is counted not just in financial terms, but also those of fitness for purpose, aesthetics, build ability or environmental impact. By applying these principles, it may be possible to make decisions at the design stage, which will avoid or reduce risks during construction work. In many cases, the large number of design considerations will allow a number of equally valid design solutions. What is important is the approach to the solutions of design problems. This should involve a proper exercise of judgement, which takes account of health and safety issues.

### **5.3 Hierarchy of Risk Control**

- 5.1 Designers shall need, so far as reasonably practicable, to avoid or reduce risks by applying a series of steps known as the hierarchy of risk control or principles of prevention and protection. The steps to be adopted shall include the following:
- (i) consider if the hazard can be prevented from arising so that the risk can be avoided (e.g., alter the design to avoid the risk);
  - (ii) if this cannot be achieved, the risk should be combated at source (e.g., ensure the design details of items to be lifted include attachment points for lifting);
  - (iii) failing this, priority should be given to measures to control the risk that will protect all people;

- (iv) only as a last resort should measures to control risk by means of personal protection be assumed (e.g., use of safety harnesses).

#### **5.4 Duty to provide health and safety risks in the drawing itself**

- 5.1 In case of situations where the designers have carried out the design work and concluded that there are risks, which are not reasonably practicable to avoid, detailed information shall be given about the health and safety risks, which remain. This information needs to be included with the design to alert others to the risks, which they cannot reasonably be expected to know. This is essential for the parties who have to use the design information.
- 5.2 If the designers' basic design assumptions affect health or safety, or health and safety risks are not obvious from the standard design document, the designer shall provide additional information. The information shall include a broad indication of the assumptions about the precautions for dealing with the risks. The information will need to be conveyed in a clear manner; it shall be included on drawings, in written specifications or outline method statements. The level of detail to be recorded will be determined by the nature of the hazards involved and the associated level of risk.

#### **5.5 Employer's approval**

- 5.1 Every structure like scaffold, false work, launching girder, earth retaining structures etc. shall have its design calculations included in the method statements in addition to health and safety risks. Employers' designer or his approved proof check consultants as applicable as per the contract conditions shall approve all these designs.
- 5.6 Any non-standard structures like trestles made up of re-bars or structures which are very old, corroded, repaired for many times etc. for which no design calculations can be made accurately from any national standards, shall not be allowed to be used at sites even for short duration.
- 5.7 If any of the above-mentioned clauses are not adhered penalty shall be imposed depending upon the gravity of the unsafe act and or condition.

### **6.0 CONTRACTOR SHE ORGANISATION**

#### **6.1 Education and Experience**

- 6.1.1 The Contractor shall appoint the required Environment, Health and Safety personnel as prescribed in General Instruction Maha-Metro/SHE/GI/001 (enclosed at the end) based upon the statutory requirement and establish the SHE organisation based upon the Contract value. The minimum educational qualification and the work experience are given in General Instruction Maha-Metro/SHE/GI/002.
- 6.1.2 The Contractor appoints a person responsible for relations with external stakeholders for the site: local communities, administrative authorities, and representatives of economic activities located within one-hour travel from the Worksite. This person will be based on the Worksite on a permanent basis. Administrations and local authorities will be informed of the existence of this person as of the start of works and will be provided with telephone contact details so as to be able to contact this person if a problem arises during the execution of works or concerning the behaviour of the Contractor's employees outside the Worksite.
- 6.1.3 In order to effectively interact on labour welfare matters with the Employer and the statutory authorities enforcing the labour welfare legislations every Contractor shall employ a duly qualified and experienced full time Labour Welfare Officer.

## **6.2 Conduct and competency**

- 6.2.1 The conduct and functioning of the Contractor SHE personnel shall be monitored by the Employer. Any default or deficiency shall attract penalty as per details given under penalty Clause of this document.
- 6.2.2 The Contractor shall ensure that all personnel are competent to perform the job assigned to them. In the event that the Contractor is unable to demonstrate the competency of any person whose activities can directly impact on the Works' SHE performance, the Employer shall remove that person from the site without any procedural formalities.
- 6.2.3 Security Guards**  
Necessary security and checks as required shall be established by the contractor to prevent entry of any unauthorised and unprotected person to the construction site.

## **6.3 Approval from Employer**

- 6.3.1 The name, address, educational qualification, work experience and health condition of each personnel deployed for SHE jobs shall be submitted to the Maha-Metro Environment, Health & Safety department in the format prescribed for the purpose for comments and approval well before the start of the work. Only on approval by the Employer these personnel are authorised to work. In case any of the SHE personnel leaves the Contractor the same shall be intimated to the Employer. The Contractor shall recruit new personnel and fill up the vacancy.

## **6.4 Responsibility of SHE personnel**

- 6.4.1 For all works carried out by the Contractor and his sub-contractors, the responsibility of ensuring the required SHE manpower lies with the main Contractor only. The minimum required manpower indicated by the Employer includes the sub-contractors' work also. It shall be the responsibility of the main Contractor to provide required SHE manpower for all the works executed by all Contractors. Necessary conditions shall be included in all sub-contract documents executed by the main Contractor.

## **6.5 Employment status of SHE personnel**

- 6.5.1 No Contractor shall engage SHE manpower from any outsourcing agencies in which case the effectiveness would be lost. All SHE manpower shall be on the payroll of the main Contractor only and not on the payroll of any subcontractor or outsourcing manpower agencies etc. This condition does not apply to positions like traffic marshals who are engaged almost on a daily requirement basis.

## **6.6 Reporting of SHE personnel**

- 6.6.1 All SHE personnel are to report to the Chief SHE Manager who shall report directly to the Chief Project Manager. The Employer Environment, Health and Safety department shall monitor adherence to this procedure at all times. In case of non-adherence penalty shall be levied as indicated in the penalty clause.

## **6.7 Inadequate SHE personnel**

- 6.7.1 Contractor shall appoint its Chief Safety Manager well before the start of activity for preparatory work like formulation, submission & approval of Safety, Health and Environment Plan, Method Statements, Environment, Health & Safety training facilities, identification & finalization of Agencies for External Safety & Health Audit, ISO certification, Safety & Health Training, Hospital Tie-up etc. The organisation shall grow as the work fronts are made available and adequate Safety & Health



manpower shall be ensured as per the contract agreement and site availability. No demobilization of Environment, safety & Health Manpower shall take place without the approval of Maha Metro concerned department and shall be remained filled till final handover of the project to Maha Metro.

- 6.7.2 In case if the Contractor fail to provide the minimum required manpower as illustrated in General Instruction Maha-Metro/SHE/GI/001 or fail to fill up vacancies created within 14 days, the same shall be provided by the Employer at Contractor's cost. Any administrative expenses involved, providing the same like paper advertisement or manpower consultant charges, etc shall also be at the cost of Contractor.

## **6.8 Prohibition of performance of other duties**

- 6.8.1 As per Schedule VIII of BOCWR, no SHE personnel shall be required or permitted to do any work which is unconnected to, inconsistent with or detrimental to the performance of the SHE duties for respective category mentioned in General Information Maha-Metro/SHE/GI/001.

## **6.9 Facilities to be provided to SHE personnel**

- 6.9.1 As per Schedule VIII of BOCWR, the Contractor shall provide all SHE personnel with such facilities, equipment and information that are necessary to enable him to dispatch his duties effectively.
- 6.9.2 The minimum Employer's requirements of such facilities / equipments to be provided for SHE personnel are given in the General Instruction Maha-Metro/SHE/GI/003.

## **7.0 CONTRACTOR SHE COMMITTEE**

- 7.1 All employees should be able to participate in the making and monitoring of arrangements for safety, industrial health and environment at their place of work. The establishment of site SHE committees in which employees and Contractor and sub-contractor management are represented can increase the involvement and commitment of employees. The Contractor shall ensure the formation and monitor the functioning of Contractor SHE committees.

## **7.2 Guidelines on Terms of Reference, Agenda, MoM of SHE Committee**

- 7.2.1 The Guidelines on Terms of Reference, Agenda, Minutes of Meeting of SHE Committee shall be as follows:

- i. To establish company Safety & Health and Environment policies and practices
- ii. To monitor the adequacy of the contractor's site Safety & Health and Environment plans and ensure its implementation
- iii. To review compliance to Safety & Health and Environment legal requirements
- iv. To review Safety & Health and Environment training
- v. To review the contractor's monthly monitoring report consisting Air and Noise monitoring results
- vi. To review the contractor's monthly waste management records
- vii. Review the progress of ISO certification
- viii. To review the contractor's monthly Safety & Health and Environment reports.
- ix. To identify probable causes of accident and unsafe practices in building or other construction work and to suggest remedial measures.
- x. To stimulate interest of Employer and building workers in safety by organizing safety week, safety competition, talks and film-shows on safety, preparing posters or taking similar other measures as and when required or as necessary.
- xi. To go round the construction site with a view to check unsafe practices and detect unsafe conditions, condition of health and welfare amenities and to recommend remedial measures for their rectifications including medical first-aid, occupational health centers and welfare facilities like canteen, rest room, drinking water, toilet/urinals etc.

- xii. Committee team members should perform a site inspection before every committee meetings and to monitor Safety & Health and Environment inspection reports.
- xiii. To bring to the notice of the Employer the hazards associated with use, handling and maintenance of the equipment used during the course of building and other construction work
- xiv. To suggest measures for improving welfare amenities in the construction site and other miscellaneous aspect of safety, health and welfare in building or other construction work.
- xv. To look into the health hazards associated with handling different types of explosives, chemicals and other construction materials and to suggest remedial measures including personal protective equipment.
- xvi. To review the last, SHE committee meeting minutes and to take action against persons/sub-contractors for non-compliance if any.

**7.3** Within 14 days of award of Contract, the SHE Committee shall be constituted and notification regarding the same shall be communicated to the members and employees as per the format provided in Form No. SF 001.

**7.4** Site SHE Committee meeting shall be conducted at least once in a month with the minimum members listed below:

Chairman	Project Manager
Secretary	Chief SHE Manager (In-charge)
Members	Labour Welfare Officer Sr. Environment Manager In charge of plant and machinery In charge of site electrics In charge of stores. Senior Managers/ Engineers heading different sub functions. Sub – contractor's representative Labour Contractor's representative Workers' representative Co-contractor representative. Other SHE staffs
Employer's Representatives	Maha-Metro Safety, Health and Environment in charge and other representatives

**7.5** Construction SHE Committee meeting shall be conducted at least once in a week with the minimum members listed below:

Chairman	Project Manager
Secretary	Chief SHE Manager (In-charge)
Members	Sr. Environment Manager Labour Welfare Officer In charge of plant and machinery In-charge of site electricity Senior Managers / Engineers heading different sub functions Sub- Contractor's representative Labour contractor's representative Workers' representatives Other SHE Staffs

## 7.6 Co-contractors' participation

- 7.6.1 In case of depot, station and other contiguous areas where more than one main contractor are working together, the Employer shall instruct the other contractors to join for the monthly SHE committee meeting of the main civil contractor, so as to discuss and decide about the common provision of security, lighting, toilet, drinking water etc. and sharing the maintenance cost of the same etc.
- 7.6.2 The general principle for sharing the cost shall be either based on the Contract value of works executed at the contiguous area or the daily average number of workmen employed by each contractor in the contiguous area.

## 7.7 Minimum time between two monthly SHE Committee meetings

- 7.7.1 A minimum period of 21 days shall be maintained between any two SHE monthly committee meetings.

## 7.8 Agenda

- 7.8.1 The Secretary shall circulate the agenda of the meeting at least seven working days in advance of the scheduled date of the meeting to all members.
- 7.8.2 The agenda should broadly cover the following:
- (i) Confirmation of minutes
  - (ii) Chairman's review/overview of site SHE performance / condition
  - (iii) Previous month SHE statistics
  - (iv) Incident and Accident Investigation / dangerous occurrence / near miss report
  - (v) Site SHE inspection
  - (vi) Sub-contractors' SHE issues
  - (vii) Safety presentation by Members
  - (viii) Report from Employer
  - (ix) Presentation on Environment aspects by Contractor's Environment representative which shall include the following:
    - (i) Legal compliance
    - (ii) Air and Noise monitoring results
    - (iii) Monthly waste management record
    - (iv) Progress of ISO certification
    - (v) Progress of Green Building Certification
    - (vi) Material consumption details (cement, aggregate, water, steel, sand etc)
    - (vii) Fly ash consumption details
    - (viii) Use of products made from recycled C&D waste products
    - (ix) Public Complaints on Environment especially related to Noise, dust and vibration
    - (x) Steps taken to improve Environment sanitation at site
    - (xi) Steps taken to address Employers instructions on Environment
    - (xii) Environmental issues related to site

## 7.9 Minutes of the meeting

- 7.9.1 The Minutes of the meeting shall be prepared as per the format provided at Form No. SF-002 and sent to all members within 2 working days preferably by mail followed by hardcopy. Safety Committee meeting minutes shall also be displayed in the notice board for wider publicity to all concerned.

## 7.10 Disciplinary Action

- 7.10.1 The chairman shall inform the members of any outstanding issues in the meeting and in case of repeated offence/ non-compliance by some members or other co/sub contractors and propose suitable disciplinary action including provisions of monetary penalty as per the relevant contract clauses, the Employer shall ensure that the same is implemented.

## 8.0 ID CARD AND FIRST DAY AT WORK, SHE ORIENTATION TRAINING

- 8.1 The Contractor shall ensure that all personnel working at the site receive an induction SHE training explaining the nature of the work, the hazards that may be encountered during the site work and the particular hazards attached to their own function within the operation. The training shall cover the contents as given in the General Instruction Maha-Metro/SHE/GI/004.

- 8.2 All personnel shall be issued a photo identity card of size 85mm x 55mm duly signed by the authorized representative of the Contractor before they are engaged for any work as per the format given in the General Instruction Maha-Metro/SHE/GI/005

- 8.2.1 Starting work sessions are organised for each employee and shall cover as a minimum:

- a) Rules of precedence
- b) Safety rules on Worksite
- c) Protection of areas adjacent to Worksite
- d) Risks relating to sexually transmitted diseases (Clause 6.7 of the GCC)
- e) Basic health: combating malaria (if prevalent) and waterborne diseases, improving hygiene
- f) Emergency response procedures or evacuation

- 8.2.2 Technical training:

- a) Training in the skills needed for tasks requiring a work permit
- b) Training in first aid and transporting the injured in order to achieve the targets defined in relevant clause on the number of first aid officers per shift.
- c) Ability to drive on rough ground.

- 8.3 Contractor shall also issue personnel SHE handbook in a language known to the workers, which provides information on SHE and emergency procedures that all personnel working on contract are required to know and the need to follow. Contractor shall ensure that this is distributed, and its content introduced to all personnel working at the site.

- 8.4 All personnel shall be issued with a temporary ID Cards on completion of Contractor's' induction. The temporary ID shall be signed by the Human Resource Manager of contractor or their appointed representative, with the validity period of one week, and after expiry of which the temporary ID Card shall be replaced with a permanent ID Card with photograph.

- 8.5 No Individuals shall be permitted to enter work site without a valid ID Card.

- 8.6 The contractor shall ensure proper accounting and records of issued and cancelled ID Cards. These ID cards shall be maintained strictly for any checks and inspections. On the expiry of the validity, new ID Card shall be issued. The expired/cancelled ID Cards shall be properly destroyed, and records shall be maintained by the contractor.

## **9.0 SHE TRAININGS**

- 9.1 The behaviour of people at all levels of the Contractor is critical for SHE performance. To achieve a more participative approach and sharing of Safety functions by site teams, the contractor shall ensure that all site staff engaged for project execution is Safety trained.
- 9.2 The Contractor shall organise quality SHE training to engage Managers, supervisors and other personnel in behavioural change and improve safety performance and effective compliance of labour welfare provisions. The attendance for the same shall be maintained and produced on demand of Maha Metro.
- 9.3 The Contractor shall analyse the training requirements for all the employees and initiate a training program to demonstrate that all persons employed, including subcontractors, are suitably qualified, competent and fit. This will include:
- i. Detailed Job descriptions for all personnel, to include their specific Safety & Health and Environment responsibilities
  - i. Specification of qualifications, competency and training requirements for all personnel
  - ii. Assessment and recording of training needs for all personnel, including subcontractors' employees in the workforce, vendor representatives and site visitors
  - iii. A system for assessing new hirers e.g. previous training
  - iv. A means of confirming that the system is effective
  - v. A matrix and schedule of training requirements, covering general, task– specific and Safety & Health and Environment-related training, showing the training frequency and interval between refresher courses
  - vi. Timely, competent delivery of training courses
- 9.4 The Contractor shall arrange behavioural-based training programmes for all the executives to identify, recognise and eliminate unsafe act and unsafe conditions.
- 9.5 The minimum Employer's requirement of training needs for various categories of employees are given in General Instruction Maha-Metro/SHE/GI/006
- 9.6 The contents of SHE training to Managers/Supervisors as given in General Instruction Maha-Metro/SHE/GI/007 shall be conducted.
- 9.7 The refresher-training programme to all employees shall be conducted once in six months for a minimum duration of 24 (3X8 hrs) working hours.
- 9.8 Toolbox talk as given in the Employer's Project SHE Manual shall be conducted to all high-risk workmen every day.
- 9.9 On-the spot practical skill development training on height safety including scaffold safety, crane safety, welding safety, electrical safety, traffic safety for marshals shall also be conducted to all foremen/workmen who were associated to the concerned jobs.
- 9.10 Every employee including workman shall take safety Oath daily without fail.

- 9.11 All vehicle drivers including heavy vehicle operators shall be trained on defensive driving at training institute recognized by Maharashtra State Road Transport Corporation / Government of Maharashtra, or any other driving institute registered under Motor Vehicles Act.
- 9.12 All the above listed training programmes except at Clause 9.11 shall be organised by the Contractor only after taking approval from the Maha Metro for the training faculty / organisation, content, and durations.
- 9.13 In case of failure on the part of the Contractor to provide all the above-mentioned training programs to all employees in time, the same shall be provided by the Employer through accredited agencies if required by formulating a common scheme to all contractors. Any administrative expenses and training fee towards the same shall be at the cost of the Contractor.
- 9.14 The Contractor detail in the training programme the actions and ESHS training for subcontractors and other members of the joint venture when applicable.
- 9.16 Records of all training conducted shall be maintained and made available for inspection and monitoring.

## **10.0 SHE INSPECTIONS**

10.1 The Contractor shall evolve and administer a system of conducting SHE inspections and other risk management analysis on a periodical basis.

10.2 The purpose of SHE inspection is to identify any variation in construction activities and operations, machineries, plant and equipment and processes against the SHE Plan and its supplementary procedures and programs.

10.3 Following SHE inspections program shall be adopted:

- i. Planned General Inspection
- ii. Routine Inspection
- iii. Specific Inspection
- iv. Other Inspection

### **10.3.1 Planned General Inspection**

10.3.1.1 Planned general inspection are performed at predetermined intervals and it usually involves the representation from both Contractor and the Employer.

10.3.1.2 Inspections that will be classified under this inspection program are:

- i. Monthly contractor and sub-contractors site Safety, Health and Environment Committee Inspection.
- ii. Weekly Safety, Health and Environment inspection by construction supervisors (Contractors and Sub-contractors)
- iii. Daily safety inspection by contractor site Safety, Health and Environment team.

### **10.3.2 Routine Inspection**

10.3.2.1 Routine inspections are often referring to the inspection of work site, equipment and temporary structures performed by site and equipment operators and temporary structure erectors.

Inspections that will be classified under this inspection program are:

- i. Daily Inspection of plant and equipment by operator
- ii. Weekly Inspection of scaffold by scaffolding supervisor
- iii. Monthly Inspection of electrical hand tools by competent electrical supervisor
- iv. Quarterly Inspection of temporary electrical systems by competent electrical supervisor
- v. Wages, PF and ESI related records
- vi. Half-yearly inspection of lifting machinery, lifting appliances, equipment and gears by Govt. approved competent person.

10.3.2.2 The list mentioned above is not exhaustive. Contractor may add additional categories. Contractors' Site SHE Manager will ensure that a system of routine inspections are carried out periodically to all plants, equipment, powered tools, and any other temporary structures that will pose a hazard to operators and workmen.

### 10.3.3 Specific Inspection

10.3.3.1 Specific inspections are performed on activities without a predetermined date. Competent supervisors usually perform inspections for ensuring an activity whether it is executed in accordance to a general set of rules; method statement submitted or developed procedures. The following are examples that will be commonly performed as required on the construction site:

- i. Inspection performed before a heavy lifting operation.
- ii. Inspection performed before and after the entry of person into a confined space.
- iii. Inspection performed before and after a welding and gas cutting operation.
- iv. Inspection of formwork before concreting by formwork erector.

10.3.3.2 The list mentioned above is not exhaustive. The contractor shall ensure that a competent supervisor inspects all high-risk processes and activities.

### 10.3.4 Other Inspection

Other inspections include the following:

- i. Mandatory Inspections by Labour Department of Government.
- ii. Maha-Metro Health & Safety management team

## 10.4 Environmental Inspection

10.4.1 The contractor shall evolve and administer a system of conducting Environment inspections on a periodic basis. The purpose of Environment inspection is to identify any variation in construction activities and operations, machineries, plant and equipment and processes against the Site Environment Plan and its supplementary procedures and programs. Following Environment inspections program shall be adopted.

- i. Planned General Inspection
- ii. Other Inspection

10.4.2 Planned General Inspection Planned general inspections are performed at predetermined intervals and it usually involves the representatives from both Contractor and the Employer. Inspections that will be classified under this inspection program are:

- i. Monthly contractor and sub-contractors site SHE committee inspection
- ii. Weekly/ daily site inspection by Contractor's Environment team

10.4.3 Other Inspections: Other inspections include the following:

- I. Maha-Metro Environment Management team
- II. Inspections by Central Pollution Control Board, /Maharashtra Pollution Control Board, Ministry of Environment and Forest and Climate Change, National Green Tribunal etc.

10.4.4 The contractor shall prepare all required Environmental inspection checklists for all activities, operations and equipment. Checklists will be prepared based on the Indian standards, rules and regulations and Employer's requirements. The formats provided in the General Instruction Maha-Metro/SHE/GI/14 shall be referred.

10.4.5 All inspection records and reports will be properly kept and filed for audit purpose.

10.4.6 Whenever employer's representative conducts an inspection, contractor shall depute its representative to accompany him/her.

10.4.7 Conformity report shall be submitted by the contractor within 1 week of submission of inspection report to the employer.

10.4.8 In case of non-conformity of items, the Employer shall take necessary steps including stoppage of work and or imposing penalty for getting the item implemented.

10.4.9 Whenever employer's representative conducts an inspection, contractor shall depute its representative to accompany him/her.

## **11.0 SHE AUDITS**

### **11.1 General**

11.1.1 The purpose and scope of SHE audit is to assess potential risk, liabilities, and the degree of compliance of construction Safety, Health & Environmental plan and its supplementary procedures and programs against applicable and current SHE legalisation regulations and requirements of the Employer.

11.1.2 Project Manager holds the ultimate responsibility in ensuring implementation of SHE audit program during the construction work.

### **11.2 Monthly Audit Rating Score (MARS)**

11.2.1 Monthly Audit Rating Score (MARS) will be performed once in a month. A team consisting of Project Manager and Employer representative based on the pre-designed score-rating format will conduct it. The details of the pre-designed monthly audit score rating formats are given in the Project SHE Manual.

11.2.2 This Monthly SHE Audit Rating Score (MARS) report will enable the Employer to evaluate the general compliance by the Contractor with the Conditions of Contract, the Employer's Project SHE Manual and the Contractor's site specific SHE Plan.

11.2.3 Monthly Audits will be conducted in accordance with Maha-Metro Guidelines. The Project Manager accompanied by the Employer's Representatives shall carry out the Audit. The Contractor's senior manager and SHE in-charge should also be invited to attend.

11.2.4 Timing



The Monthly Audit Rating Score (MARS) should be conducted at least 7 days prior to the scheduled date of Monthly SHE Committee meeting.

#### 11.2.5 Evaluation

11.2.5.1 The numerical scoring has been weighed on a 1-10 scale. The audit team will use their observations noted in evaluating the points to be awarded against each of the elements of the audited section. Wherever some topics and sub-topics are not applicable the score rating need not be given. The overall audit ratings shall be achieved by:

$$\text{Overall Audit Rating} = \frac{\text{Actual Score Achieved}}{\text{Max Possible Score}} * 100$$

11.2.5.2 The criticality of the required actions for the respective sections of the Audit will be classified as:

SN	Score	Description	Action
1	< 60%	Immediate	Require Contractor to rectify within 24 hours
2	< 75%	Improvement Necessary	Contractor rectification within 7 days and confirmed in writing to Employer
3	< 90%	Improvement Desirable	Contractor rectification within one month and confirmed in writing to Employer

#### 11.2.6 Report

A copy of each Audit Report will be sent to Employer and to all subcontractors, with whom it will then be discussed in detail at the Monthly health and safety Committee Meeting in order to ensure that any corrective actions are agreed upon.

### 11.3 Monthly Electrical Safety Audit

11.3.1 A team comprising of Contractor's senior SHE (Electrical) engineer and Employer's Representative shall conduct monthly electrical safety audit covering the following and submit the report to Employer:

- I. Electrical accidents investigation findings and remedy
- II. Adequacy of power generation and power requirements
- III. Power distribution and transmission system in place
- IV. Updated electrical single line diagram showing the current condition of power source and distribution including the IP44 DBs arrangement.
- V. Electrical protection devices – selection, installation and maintenance.
- VI. Earth or ground connection and earth pit maintenance details
- VII. Education and training of electrical personnel undertaken
- VIII. Routine electrical inspection details
- IX. Electrical maintenance system and register.
- X. Name plate details of major electrical equipment
- XI. Classified zones in the site, if any.

#### 11.4 External Health and Safety Audit

11.4.1 External Health & Safety audits are to be conducted by external agencies having excellent competency in Health and Safety with the prior approval of the Employer.

#### 11.4.2 Areas of competence of Audit team:

11.4.2.1 Practical understanding of BOCW Act and Rules, statutory requirements on health/medical and welfare of workmen, construction hazards and its prevention and control, traffic management, electrical safety, rigging, safety of construction equipment and construction environment management.

11.4.2.2 Audit shall be conducted as per the guidelines of ISO, ILO, and national standards. Audit report shall also be presented as per the above formats.

11.4.3 External Health and Safety audits shall be conducted on a quarterly basis throughout the currency of the Contract.

11.4.4 **Targets of Health & Safety Audit:** The contents and coverage of the external audit shall include the following items

11.4.4.1 Safety and Health management

- I. Safety & Health Organization
- II. Safety & Health policy and plan
- III. SHE Committee
- IV. Safety & Health orientation
- V. Safety & Health training
- VI. Safety & Health inspection
- VII. Safety & Health communication and motivation
- VIII. Safety & Health submittals to the employer
- IX. Safety & Health promotional and awareness program
- X. Incident reporting and investigation
- XI. Onsite/Offsite Emergency preparedness plan
- XII. Hazard identification and Risk Assessment

11.4.4.2 Technical

- I. Work Method Statements
- II. Operational Control Procedures / Safe operating procedures
- III. Working at Height
- IV. Hand tools and Power tools
- V. Electrical Safety
- VI. Fire prevention and control
- VII. Housekeeping
- VIII. Overhead protection
- IX. Slipping, Tripping, Cutting, Drowning and Falling hazard
- X. Lifting appliances and Gear, Tools and Tackles
- XI. Lifting and Launching operation
- XII. Construction plant and machinery
- XIII. Machine and area guarding
- XIV. Material handling

- XV. Hot Work
- XVI. Demolition
- XVII. Excavation and Tunneling
- XVIII. Work Permit System
- XIX. Traffic Management
- XX. Chemical Handling
- XXI. Dangerous and Harmful Environments
- XXII. Maintenance matrix of Mechanical and Electrical Machines / Equipment's
- XXIII. Working on or under water
- XXIV. Working near or under High Tension line
- XXV. Personal Protective Equipment's
- XXVI. Visitors at Site
- XXVII. Occupational Health and Welfare measures
- XXVIII. All statutory Forms, returns under various statutes

#### 11.4.5 Audit Documents

11.4.5.1 Contractor shall make the below listed documents available for the review by the Audit team.

- i. Safety & Health policy
- ii. Safety Inspections
- iii. Safety & Health organization chart
- iv. Annual Safety & Health objectives / programs
- v. Accident / near miss statistics and analysis
- vi. Safety & Health Training program / records for all personnel
- vii. Operation and Maintenance manual of all equipments including Safe operating procedures for various activities, checklists etc.
- viii. Records of test and examination of all lifting appliances and gears, plant and machines
- ix. Medical records for all personnel
- x. Risk identification, assessment and control details
- xi. On-site emergency plans and records of Mock Drills
- xii. Records of work permits
- xiii. Record of monitoring of flammable and explosive substances at work place
- xiv. Maintenance and testing of firefighting equipment's
- xv. All statutory Registers, Forms, Returns under various statutes
- xvi. First Aid, Medical facilities and other welfare measures
- xvii. Material Safety Data Sheets
- xviii. Housekeeping inspection records
- xix. Minutes of SHE committee meetings
- xx. Maintenance procedure of Plant & machines
- xxi. Calibration & Testing records
- xxii. Records of previous Audits

- xxiii. Safety inspection records

#### 11.4.6 Audit Preparation

- i. Audit team members are required to gather information by observations through interviews and by checks of hardware and documentation.
- ii. Audit team shall prepare checklist to cover all parts based on SHE legislations rules and regulations and Maha-Metro requirements.
- iii. Audit team members shall verify the facts and findings leading to the identified gaps and weakness.
- iv. Audit leader has overall responsibility for reaching a conclusion.

#### 11.4.7 Reporting

11.4.7.1 Audit report shall be prepared and directly sent to the Employer within 7 days of conducting the audit with a copy to the contractor.

#### 11.4.8 Report contents

- i. **Executing summary:** Based on the finalized checklists as written the findings to the Employer by the audit team members, the audit leader will compile a concise and accurate summary of observations and findings.
- ii. **Introduction:** This will contain basic information regarding the facilities or organization audited, the specific audit dates (inclusion of those for preparation and post-audit activities).
- iii. **Principal positive findings:** This will contain the summary of positive aspects as observed by the auditors. It will also contain highlights of those issue, which may warrant dissemination as best practice regarding methodology used or achievement.
- iv. **Audit Findings:** All audit findings as detailed in the audit checklists shall be grouped together as priority 1 and 2 as detailed below in a separate listing.
  - A. **Priority 1:** Actions to rectify gaps or weakness should generally be implemented within 2 – weeks, if risk potential is high or unacceptable.
  - B. **Priority 2:** Actions should be generally implemented or rectified with a maximum of 3 – 4 weeks, if not rectified would create a likelihood of minor injury or business loss.

#### 11.4.9 Conformity Report & Action by Employer

11.4.9.1 The auditor shall inspect the site after 14 days of conducting initial audit for checking the adequacy of implementation of items maintained under priority 1 by the Contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the contractor.

11.4.9.2 The auditor shall again inspect after 28 days of conducting initial audit for checking the adequacy of implementation of items mentioned under priority 2 by the Contractor and shall submit a conformity / non-conformity report to the Employer with a copy to the Contractor.

11.4.9.3 In case of non-conformity of items mentioned by auditor, the Employer shall take necessary steps including stoppage of work and or imposing any penalty for getting the item implemented.

11.4.9.4 Failure of Contractor to conduct External SHE Audit

11.4.9.5 If the Contractor fails to conduct the external, SHE audit in time, the Employer at the cost of Contractor shall get it done.

## **11.5 Environmental Audit**

### **11.5.1 Contractor's Environmental Audit**

11.5.1.1 The purpose and scope of environmental audit is to assess the degree of compliance of environmental plan and its supplementary procedures and programs against applicable and current environment legislations and requirements of the employer.

11.5.1.2 The employer may undertake regular audits at monthly/quarterly intervals of the contractor's onsite practices and procedures as a means of assessing the ongoing performance of the contractor.

11.5.1.3 Monthly/quarterly audits will be conducted in accordance with Maha-Metro SHE guidelines. The contractor's Project Manager, Chief SHE/Senior Environment Manager accompanied by Maha-Metro Environment department shall carry out the audit.

11.5.1.4 A checklist of environmental requirements will be prepared amended as necessary, throughout the construction phase to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

11.5.1.5 The criteria against which the review will be undertaken will be derived from (but not limited to):

- a) The appropriate approaches, procedures and commitments given by the contractor in the 'Site Environmental Management Plan'
- b) The clauses contained within the Employer's Requirement on Environment.
- c) The allocation of responsibility for fulfilling environmental requirement and the effective lines of communication with regard to environmental issues;
- d) Compliance with procedure established to enable and effective response to environmental incident, exceedance or non-compliance;
- e) The extent and accuracy of record-keeping related to environmental performance indicators;
- f) The effectiveness of ensuring high levels of awareness with regard to environmental requirements; and
- g) The effectiveness of environmental management activities including the speed and effectiveness of responses to complaints.

11.5.1.6 The criteria against which the audits will be undertaken shall be derived from the clauses within the Employer's Requirements contract-specific Site Environmental Plan and previous site inspection results.

11.5.1.7 A copy of each Audit Report will be sent to Maha-Metro Environment Department and to all subcontractors, with whom it will then be discussed in detail at the Monthly SHE Committee Meeting in order to ensure that any corrective actions are agreed upon.

### **11.5.2 External Environmental Audit**

11.5.2.1 External Environmental audits are to be conducted by external agencies that are competent in formulating of Environmental Management measures for construction sector shall be engaged with prior approval from the Environment Department of Maha-Metro.

11.5.2.2 The audit team shall undertake regular audits at quarterly intervals, of the contractor's onsite practices and procedures as a means of assessing the on going performance of the contractor.

11.5.2.3 A checklist of Environmental requirements will be prepared and amended as necessary, throughout the construction phase to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

#### **11.5.2.4 Areas of competence of Audit team/Auditors**

- a) Environmental auditors shall have a regular and qualified degree in Environment and have excellent understanding of environmental issues, knowledge of environmental requirements at construction sites, and shall have demonstrable experience of at least five years in environment management issues.

11.5.2.5 Audit shall be conducted as per the requirements laid out in the conditions of contract on environment, as the case may be.

11.5.2.6 External Environmental audits shall be conducted on a quarterly basis throughout the currency of the contract.

#### **11.5.2.7 Audit Documents:**

11.5.2.7.1 Contractor shall make the below listed documents available for the review by the Audit team

- a) Environmental policy
- b) Site Environment Plan
- c) Environmental Rules and Regulation
- d) Environmental organization chart
- e) Annual Environmental objectives / programs
- f) Environment Training program / records for all personnel
- g) Environment monitoring and management reports
- h) Environmental submittals to the employer
- i) Environmental monitoring reports
- j) Environmental sanitation records
- k) Minutes of SHE committee meetings

#### **11.5.2.8 Reporting:**

11.5.2.8.1 Audit report shall be prepared and directly sent to the Employer within 7 days of conducting the audit with a copy to the contractor.

#### **11.5.2.9 Report contents:**

- i) **Executing summary** - the audit leader will compile a concise and accurate summary of observations and findings.
- ii) **Introduction** - this will contain basic information regarding the facilities or organization audited, the specific audit dates (inclusion of those for preparation and post-audit activities).
- iii) **Principal positive findings** - This will contain the summary of positive aspects as Observed by the auditors. It will also contain highlights of those issue, which may warrant dissemination as best practice regarding methodology used or Achievement.
- iv) **Audit Findings** - All audit findings as detailed in the audit checklists shall be grouped together as priority 1 and 2 as detailed below in a separate listing.

- a. **Priority 1:** Actions to rectify gaps or weakness should generally be implemented within two-weeks time, if risk potential is high or unacceptable.
- b. **Priority 2:** Actions should be generally implemented or rectified with a maximum of 3 – 4 weeks, if not rectified would create a likelihood of minor injury or business loss.

#### **11.5.2.10 Conformity Report & Action by Employer**

- 11.5.2.10.1 The auditor shall inspect the site after 14 days of conducting initial audit for checking the adequacy of implementation of items maintained under priority 1 by the contractor and shall submit a conformity/non-conformity report to the Employer with a copy to the contractor.
- 11.5.2.10.2 The auditor shall again inspect after 28 days of conducting initial audit for checking the adequacy of implementation of items mentioned under priority 2 by the contractor and shall submit a conformity/non-conformity report to the Employer with a copy to the contractor.
- 11.5.2.10.3 In case of non-conformity of items mentioned by auditor, the Employer shall take necessary steps including stoppage of work and or imposing any penalty for getting the item implemented.
- 11.5.2.10.4 Failure of contractor to conduct External Environmental Audit:- If the contractor fails to conduct the external Environment audit in time, the Employer at the cost of contractor shall get it done.

### **12.0 SHE COMMUNICATIONS**

- 12.1 The Contractor shall take every effort to communicate the Safety, Occupational health and Environment management measures through posters campaigns / billboards / banners / glow signs being displayed around the work site as part of the effort to rise safety awareness amongst to the work force. Posters should be in Hindi, English and other suitable language deemed appropriate. Posters / billboards / banners/ glow signs should be changed at least once in a month to maintain the impact.
- 12.2 The Contractor shall also observe important days as listed in General Instruction Maha-Metro/SHE/GI/008 and printing and displaying safety signage and posters as listed in General Instruction Maha-Metro/SHE/GI/009
- 12.3 The list indicated are the minimum requirements of the Employer and the Contractor is encouraged to further the SHE communication activities by formulating suitable reward schemes for safety performers and any other activities, which deem fit for the purpose.

### **13.0 SHE SUBMITTALS TO THE EMPLOYER**

- 13.1 The Contractor's SHE management should send the following reports to the Employer periodically:
  - i) Daily Reporting of total number of workmen (as given in Clause 13.2)
  - ii) Monthly Environment, Health and Safety Report (as given in Clause 13.3)
  - iii) SHE Committee Meeting Minutes (as given in relevant clause)
  - iv) SHE Inspection Reports
  - v) External Environment Audit report
  - vi) External Health & Safety Audit Report
  - vii) Monthly Audit Rating Score (MARS) and Electrical Safety Audit Report etc.

#### **13.2 Daily Reporting of total number of workmen**

- 13.2.1 The Contractor shall report to the Employer the total number of workmen engaged by all including any subcontractor within 2 hours of starting of any shift in any day. This reporting shall be the primary duty of the Chief SHE Manager of the Contractor and reporting shall be through tele-fax / email. The onus of checking the receipt of the same by the Employer lies with the Contractor. If the information is not received or received more than 2 hrs after starting of the shift, penalty shall be levied as per relevant clause.

### 13.3 Monthly SHE Report

- 13.3.1 The Contractor shall prepare a monthly SHE reports consisting of the following and submit 3 copies within 7<sup>th</sup> of next month to the Employer as specified in the Project SHE Manual.

<b>Monthly Health &amp; Safety Report</b> consisting of the followings:	
I.	Monthly Accident Statistics
II.	Monthly accident / incident details category wise.
III.	SHE committee details
IV.	Details of Safety & Health training conducted in the month
V.	Safety & Health Inspection and Compliance status
VI.	Brief details of Safety & Health internal audit like Electrical audit, MARS etc.
VII.	Safety & Health Communication activities undertaken in the month including the number of posters displayed and balance availability in stock.
VIII.	Toolbox talks details
IX.	PPE details: Quantity purchased, issued to the workmen and stock available.
X.	Details on lighting poles, welding and cutting equipment's and inspection of Ladders, Hoists, Lifting appliances, tools & tackles etc.
XI.	Monthly site illumination monitoring results including emergency power back up
XII.	Housekeeping
XIII.	Barricade lighting and maintenance details
XIV.	No of critical excavations
XV.	Health & Welfare activities, Statutory Registers and returns
XVI.	Safety walk conducted by Contractors' Project Manager in the month
XVII.	Safety & Health Activities Planned for next month
XVIII.	Maintenance schedule of plant and machines
<b>Monthly Environmental Report</b> shall include (but not limited to) the followings:	
I.	Executive summary
II.	Brief mention of construction activities
III.	Monitoring report of Air, noise, water, soil and DG set stack quality
IV.	Waste Management Record i.e. quantity generated and disposed of all types of wastes for the month and cumulative quantities
V.	Details of C&D waste produce procured and consumed
VI.	Details of Water Consumption for the month and cumulative consumption
VII.	Details of fly ash consumption for the month and cumulative consumption
VIII.	Raw materials consumption for the month and cumulative consumption
IX.	Weekly Environment Inspection checklist
X.	Details of environmental training imparted
XI.	Point wise compliance of Maha-Metro comments made on previous Monthly Environmental Report

## 14.0 ACCIDENT REPORTING AND INVESTIGATION

### 14.1 Reporting to Employer

- 14.1.1 All accidents, "near miss" and dangerous occurrences shall immediately be informed verbally to the Employer. This will enable the Employer to reach to the scene of accident / dangerous occurrences



to monitor/assist any rescue work and/or start conducting the investigation process so that the evidences are not lost.

14.1.2 Reports of all accidents (fatal / injury) and dangerous occurrences shall also be sent within 24 hours as per approved format.

14.1.3 No accident / dangerous occurrences are exempted from reporting to the Employer.

14.1.4 Any wilful delay in verbal and written reporting to the Employer shall be penalised as per relevant clause.

#### **14.1.5 Near Miss**

An incident or a situation with clear potential for an undesirable outcome to occur, even though no actual negative consequences happened. In other words, it is an event with potential to cause injury, property damage, environmental release, or an adverse community reaction. Generally, the following events are some examples of near miss when:

- i) A person trips over an object and falls to the ground but did not get injured
- ii) A person has to dive or jump out of the way to avoid a collision with a motorized vehicle, a moving object like a suspended part on a conveyor or from an uncontrolled suspended load;
- iii) A person has to jump from a falling ladder;
- iv) An object with significant mass falls from a distance of sufficient height that would cause injury to a person if they were struck;
- v) A machine part becomes a projectile;
- vi) A person works on a piece of equipment that he/EHS believes is de-energized and that equipment starts up putting that person in jeopardy;
- vii) A low-speed collision occurs and an occupant of that vehicle is not wearing a seat belt and is not injured.
- viii) Stored energy unexpectedly releases which could cause injury if a person were struck or contacted, e.g., a high-tension spring (like your garage door spring) breaks or a pocket of steam releases;
- ix) Any steps of the vessel entry procedure are omitted in a vessel entry;
- x) Any emergency equipment (fire extinguisher, Scott Air Pack, Oxygen sensor, eye wash, etc) fails to operate properly when called on in an emergency.

If Protective Equipment is called for and worn and it prevents an injury, then in this case it would not be a near miss. As an example, a mechanic is wearing a hard hat in a barricaded area where hard hats must be worn and a 100gram bolt falls from a height of 2 meters and strikes his hard hat and no injury occurs. That would not be a near miss. But if he were not wearing a hardhat and the bolt falls a meter away, then it would be a near miss.

14.1.6 Each non-conformity will be documented by a digital photograph with captions to provide a visual illustration, explicitly indicating the location, date of inspection and the non-conformity in question.

#### **14.2 Reporting to Government organisations**

14.2.1 In addition to the above verbal and written reporting to the Employer, as per Rule 210 of BOCWR, notice of any accident to a worker at the building or construction site that:

- i) causes loss of life; or

- ii) disables a worker from working for a period of 48 hours or more immediately following the accident;
- iii) shall forthwith be sent by telegram, telephone, fax, or similar other means including special messenger within four hours in case of fatal accidents and 72 hours in case of other accidents, to:
  - a. the Regional Labour Commissioner, wherein the Contractor has registered the firm/work
  - b. the board with which the worker involved was registered as a beneficiary;
  - c. Director General and
  - d. the next of kin or other relative of the worker involved in the accident;

14.2.2 Further, notice of accident shall be sent in respect of an accident which:

- i) causes loss of life; or
- ii) disables the injured worker from work for more than 10 days to
  - a. the officer-in-charge of the nearest police station;
  - b. the District Magistrate or, if the District Magistrate by order so desires, to
  - c. the Sub-Divisional Magistrate

14.2.3 In case of an accident-causing minor injury, first-aid shall be administered and the injured worker shall be immediately transferred to a hospital or other place for medical treatment.

14.2.4 Where any accident-causing disablement that subsequently results in death, notice in writing of such death, shall be sent to the authorities mentioned in Clause 14.2.1 and 14.2.2 above within 72 hours of such death.

#### **14.2.5 Reporting of dangerous occurrences**

14.2.5.1 The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

- a. collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of building or construction material or breakage or failure of rope, chain, or loose gears; or overturning of cranes used in construction work;
- b. falling of objects from height;
- c. collapse or subsidence of soil, tunnel, pipe lines, any wall, floor, gallery, roof or any other part of any structure, launching girder, platform, staging, scaffolding or means of access including formwork;
- d. explosion of receiver or vessel used for storage of pressure greater than atmospheric pressure, of any gas or gases or any liquid or solid used as building material;
- e. fire and explosion causing damage to any place on construction site where building workers are employed;
- f. spillage or leakage of any hazardous substance and damage to their container;
- g. collapse, capsizing, toppling or collision of transport equipment;
- h. leakage or release of harmful toxic gases at the construction site;

14.2.6 In case of failure of launching girder, lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances,

gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Authorities;

- 14.2.7 Every notice given for fatal accidents or dangerous occurrences shall be followed by a written report to the concerned Authorities under Section 39 of BOCWA and the Director General in the specified Form XIV of BOCWR.

### **14.3 Accident investigation**

#### **14.3.1 General**

- 14.3.1.1 Investigations should be conducted in an open and positive atmosphere that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences.

- 14.3.1.2 Accidents and Dangerous Occurrences which result in death, serious injury or serious damage must be investigated by the Contractor immediately to find out the cause of the accident/occurrence so that measures can be formulated to prevent any recurrence.

- 14.3.1.3 Near misses and minor accidents should also be investigated by the Contractor as soon as possible as they are signals that there are inadequacies in the safety management system.

#### **14.3.1.4 Procedure of incident investigation**

- 14.3.1.4.1 It is important after any accident or dangerous occurrence that information relating to the incident is gathered in an organised way. The following steps shall be followed:

- a. take photographs and make sketches
- b. examine involved equipment, workplace or material and the environmental conditions
- c. interview the injured, eye-witnesses and other involved parties
- d. consult expert opinion where necessary
- e. identify the specific Contractor or sub-contractor involved.
- f.

- 14.3.1.5 Having gathered information, it is then necessary to make an analysis of incident

- a. establish the chain of events leading to the accident or incident
- b. find out at what stage the accident took place
- c. consider all possible causes and the interaction of different factors that led up to the accident, and identify the most probable cause. The cause of an accident should never be classified as carelessness. The specific act or omission that caused the accident must be identified.

- 14.3.1.6 The next stage is to proceed with the follow-up action

- a. report on the findings and conclusions
- b. formulate preventive measures to avoid recurrence
- c. publicise the findings and the remedial actions taken

### **14.4 Employers' independent incident investigation**

- 14.4.1 In case of fatal / dangerous occurrence the Employer shall also conduct independent investigation. Contractor and his staff shall extend necessary co-operation and testify about the accident.

- 14.4.2 The Contractor shall take every effort to preserve the scene of accident till the Employer completes the investigation.

- 14.4.3 All persons summoned by the Employer in connection to witness recording shall obey the instructions without delay. Any wilful suppression of information by any person shall be removed from the site immediately and / or punishable as per relevant penalty clause.

**15.0 EMERGENCY PREPAREDNESS PLAN**

- 15.1 The Contractor shall prepare as required under Rule 36 of BOCWR, an Emergency Response Plan for all work sites as a part of the Contractor SHE Plan. The plan shall integrate the emergency response plans of the Contractor and all other subcontractors. The Emergency Response Plan shall detail the Contractor's procedures, including detailed communications arrangements, for dealing with all emergencies that could affect the Site. This include where applicable, injury, sickness, evacuation, fire, chemical spillage, severe weather and rescue.
- 15.2 The Contractor shall ensure that an Emergency Response Plan is prepared to deal with emergencies arising out of:
- i) Fire and explosion
  - ii) Collapse of lifting appliances and transport equipment
  - iii) Collapse of building, sheds, or structure etc.
  - iv) Gas leakage or spillage of dangerous goods or chemicals
  - v) Bomb threatening, Criminal or Terrorist attack
  - vi) Drowning of workers
  - vii) Landslides getting workers buried floods, Earthquake, storms, and other natural calamities.
- 15.3 Arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the Contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.
- 15.4 Contractors shall require to tie-up with the hospitals and fire stations located in the neighbourhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.
- 15.5 Contractor shall conduct an onsite emergency mock drill once in every month for all his workers and his subcontractor's workers.
- 15.6 It shall be the responsibility of the Contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to Maha-Metro, telephonically initially and followed by a written report, shall be made by the Contractor.
- 15.7 Necessary interfacing and coordination with other working contractors shall be insured by the contractors through the Nodal Officer in charge of the site.

**16.0 EXPERTS / AGENCIES FOR SHE SERVICES**

- I. Contractors may utilise the services of experts/agencies empanelled under Rule 250 of BOCWR for the purpose of training, internal audit and any other SHE services with prior approval of the Employer.
- II. As an aide to contractors, a list of experts/agencies and the offered service are given in General Instruction Maha-Metro/SHE/GI/010 for ready reference. In addition to it if the Contractor would like to use any expert/agencies' services for any SHE activities the same can also be allowed provided that they are competent and meet to the general requirements of Employer. In every case prior approval of the Employer is mandatory.

## **PART II: SAFETY**

### **17.0 HOUSEKEEPING**

- 17.1 Housekeeping is the act of keeping the working environment cleared of all unnecessary waste, thereby providing a first-line of defence against accidents and injuries.
- 17.2 Contractor shall understand and accept that improper housekeeping is the primary hazard in any construction site and ensure that a high degree of housekeeping is always maintained. Indeed "Cleanliness is indeed next to Godliness"
- 17.3 Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.
- 17.4 General Housekeeping shall be carried out by the Contractor and ensured at all times at Work Site, Construction Depot, Batching Plant, Labour Camp, Stores, Offices, and toilets / urinals. Towards this the Contractor shall constitute a special group of housekeeping personnel as per General Instruction Maha-Metro/SHE/GI/001. This group shall ensure daily cleaning at work sites and surrounding areas and maintain a register as per the approved format by the Employer.
- 17.5 Adequate time shall be assigned to ensure that good housekeeping is maintained. Team of housekeeping squad shall carry out this.
- 17.6 The Contractor shall be responsible to provide segregated containers for disposal of debris at required places and regular cleaning of the same.
- 17.7 Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public. The barricade especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the Employer. These shall be maintained in one line and level.
- 17.8 The structure dimension of the barricade, material and composition, its colour scheme, Maha-Metro logo and other details shall be in accordance with specifications laid down in tender document.
- 17.9 All stairways, passageways and gangways shall be maintained without any blockages or obstructions. All emergency exits passageways, exits fire doors, break-glass alarm points, fire fighting equipment, first aid stations, and other emergency stations shall be kept clean, unobstructed and in good working order.
- 17.10 Lumber with protruding nails shall be bent or removed and properly stacked.
- 17.11 All surplus earth and debris are removed/disposed off from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact shall be covered while moving. The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.
- 17.12 No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement. All truck drivers should generally be accompanied by a Cleaner.

- 17.13 Roads shall be kept clear and materials like: pipes, steel, sand boulders, concrete, chips, and brick etc. shall not be allowed on the roads to obstruct free movement of road traffic.
- 17.14 Water logging or bentonite spillage on roads shall not be allowed. If bentonite spillage is observed on road endangering the safety of road users, the Contractor shall be penalised as per relevant clause.
- 17.15 Proper and safe stacking of material are of paramount importance at yards, stores, and such locations where material would be unloaded for future use. The storage area shall be well laid out with easy access and material stored / stacked in an orderly and safe manner.
- 17.16 Flammable chemicals / compressed gas cylinders shall be safely stored.
- 17.17 Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas shall be removed to identified locations(s).
- 17.18 All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).
- 17.19 Empty cement bags and other packaging material shall be properly stacked and removed.
- 17.20 The Contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provisions related to house keeping.
- 17.21 Cover many general issues around safety management, but not establishing rules of procedure.
- 17.21.1 Rules of procedure are established by the Contractor for Worksites, addressing the following: safety rules, zero tolerance for substance abuse (refer relevant clause), environmental sensitivity of areas around the Worksites, the dangers of STDs and HIV/AIDS and respect for the beliefs and customs of the populations and community relations generally.
- 17.21.2 The rules are clearly displayed at the different Worksites and posted in the Contractor's vehicles and machinery driving cabs.
- 17.21.3 The rules confirm the Contractor's commitment to implementing the ESHS provisions provided for in the Contract.
- 17.21.4 New employees and existing members of personnel are made aware and acknowledge their understanding of the rules of procedure and the associated provisions. Rules of procedure document are initialed by all employees prior to the start of works.
- 17.21.5 Pursuant to Clauses 6.9 and 6.11 of the GCC, the rules of procedure include a list of acts considered as serious misconduct and which result in dismissal by the Contractor should an employee repeatedly commit the offence despite awareness of the rules of procedure, and this is without prejudice to any legal action by the public authority for non-compliance with applicable regulations:
- I. Drunkenness during working hours, leading to risks for the safety of local inhabitants,
  - II. customers, users and personnel,
  - III. Punishable statements or attitudes, and sexual harassment in particular,
  - IV. Violent behavior,
  - V. Intentional damage to the assets and interests of others, or the environment,

- VI. Repeated negligence or imprudence leading to damage or prejudice to the environment the population or properties, particularly breaching provisions intended to prevent the spreading of STD and AIDS,
- VII. Drug use,
- VIII. Possession and/or consumption of meat or any other part of an endangered animal or plant as defined in the Washington convention (CITES) and national regulations
- IX.

17.21.6 Serious misconduct, such as organization of sex trade (pimping), committing pedophilia, physical aggression, drug trafficking, deliberate and severe pollution, trading and/or trafficking in all or part of protected species, will lead to immediate dismissal as of the first report of misconduct is detected, in application of the rules of procedure and labour laws.

17.21.7 The employer establishes a record for each case of serious misconduct, and a copy will be provided to the employee in question, indicating all action taken to terminate the misconduct by the employee in question and to bring the attention of other members of personnel to the type of incident detected. This record will be provided to the Engineer as an attachment to the monthly report

## **17.22 Joint Interphase safety walks**

17.22.1 It is the responsibility of the civil contractor CSM to arrange weekly or as and when required joint interphase safety walks with all the concerned civil and system contractors CSM and site team to highlight various SHE related issues.

## **17.23 OHE Charging & Train movements during construction phase**

17.23.1 One of the high risk activity during the construction stage is overhead OHE charging and train movement for signal and trains testing. All the concerned contractors Project manager and CSM have to give necessary safety clearance for the same in writing. There shall be no obstruction and/or infringements for the same.

## **18.0 WORKING AT HEIGHT**

### **18.1 Definitions**

18.1.1 **"access"** and **"egress"** include ascent and descent.

18.1.2 **"Fragile surface"** means a surface, which would fail if any reasonably foreseeable loading were to be applied to it.

18.1.3 **"line"** includes rope, chain, or webbing

18.1.4 **"Personal fall protection"** means:

- I. a fall prevention, work restraint, work positioning, fall arrest or rescue system, other than a system in which the only safeguards are collective safeguards; or
- II. rope access and positioning techniques;

18.1.5 **"Work at height"** means:

- I. work in any place, including a place at or below ground level;

- II. obtaining access to or egress from such place while at work, except by a staircase in a permanent workplace, where, if protective measures were not taken, a person could fall a distance liable to cause personal injury;

18.1.6 **"Work equipment"** means any machinery, appliance, apparatus, tool or installation for use at work (whether exclusively or not) and includes:

- I. a guard-rail, toe-board, barrier, or similar collective means of protection
- II. a working platform
- III. a net, airbag, or other collective safe guard for arresting falls
- IV. personal fall protection system
- V. ladders

18.1.7 **"Working platform"** means:

- I. any platform used as a place of work or as a means of access to or egress from a place of work;
- II. includes any scaffold, suspended scaffold, cradle, mobile platforms, trestle, gangway, gantry and stairway which is so used.

## 18.2 Organisation and planning

The Contractor shall ensure that work at height is:

- I. properly planned for any emergencies and rescue
- II. appropriately supervised; and
- III. carried out in a manner, which is reasonably practicable safe.

18.3 The Contractor shall ensure that work at height is carried out only when the weather conditions do not jeopardise the health or safety of persons involved in the work.

## 18.4 Competence

The Contractor shall ensure that no person engages in any activity, including organization, planning and supervision, in relation to work at height or work equipment for use in such work unless he is competent to do so or, if being trained, is being supervised by a competent person.

## 18.5 Avoidance of risks from work at height

The Contractor shall ensure that work is not carried out at height where it is reasonably practicable to carry out the work safely otherwise than at height.

18.6 Where work is carried out at height, the Contractor shall take suitable and sufficient measures as given below to prevent, so far as is reasonably practicable, any person falling a distance liable to cause personal injury.

- i) his ensuring that the work is carried out:
  - A. from an existing place of work; or
  - B. (In the case of obtaining access or egress) using an existing means, complying to the requirements as given in relevant clause.

Where it is reasonably practicable to carry it out safely and under appropriate ergonomic conditions; and



- ii) Where it is not reasonably practicable for the work to be carried out in accordance with sub-paragraph (a), his providing sufficient work equipment for preventing, so far as is reasonably practicable, a fall occurring.

18.7 Where the measures taken under Clause 18.6 do not eliminate the risk of a fall occurring, every Contractor shall:

- i) So far as is reasonably practicable, provide sufficient work equipment to minimise:
  - a. The distance and consequences; or
  - b. Where it is not reasonably practicable to minimise the distance, the consequences, of a fall; and
- ii) Without prejudice to the generality of Clause 18.4, provide such additional training and instruction or take other additional suitable and sufficient measures to prevent, so far as is reasonably practicable, any person falling a distance liable to cause personal injury.

#### 18.8 Selection of 'work equipment' for work at height

- i) The Contractor, in selecting work equipment for use in work at height, shall:
  - a. Give collective protection measures priority over personal protection measures; and
  - b. Take account of:
    - 1. The working conditions and the risks to the safety of persons at the place where the work equipment is to be used;
    - 2. In the case of work equipment for access and egress, the distance to be negotiated;
    - 3. The distance and consequences of a potential fall;
    - 4. The duration and frequency of use;
    - 5. The need for easy and timely evacuation and rescue in an emergency; and
    - 6. Any additional risk posed by the use, installation, or removal of that work equipment or by evacuation and rescue from it;
- ii) The Contractor shall select work equipment for work at height which:
  - (a) has characteristics including dimensions which:
    - 1) Are appropriate to the nature of the work to be performed and the foreseeable loadings; and
    - 2) Allow passage without risk; and
  - (b) Is in other respects the most suitable work equipment, having regard in particular to the purposes specified in Clause 18.5 and 18.6.

#### 18.9 Fragile surfaces

18.9.1 The Contractor shall ensure that no person at work passes across or near, or working on, from or near, a fragile surface where it is reasonably practicable to carry out work safely and under appropriate ergonomic conditions without his doing so.

18.9.2 Where it is not reasonably practicable to carry out work safely and under appropriate ergonomic conditions without passing across or near, or working on, from or near, a fragile surface, every Contractor shall:

- I. ensure, so far as is reasonably practicable, that suitable and sufficient platforms, coverings, guard rails or similar means of support or protection are provided and used so that any foreseeable loading is supported by such supports or borne by such protection;
- II. where a risk of a person at work falling remains despite the measures taken under the preceding provisions of this regulation, take suitable and sufficient measures to minimise the distances and consequences of his fall.

18.9.3 Where any person at work may pass across or near, or work on, from or near, a fragile surface, every Contractor shall ensure that:

- (i) prominent warning notices are so far as is reasonably practicable affixed at the approach to the place where the fragile surface is situated; or
- (ii) where that is not reasonably practicable, such persons are made aware of it by other means.

#### **18.10 Falling objects**

18.10.1 The Contractor shall, wherever necessary to prevent injury to any person and damage to the property of third party, take suitable and sufficient steps to prevent, so far as is reasonably practicable, the fall of any material or object.

18.10.2 where it is not reasonably practicable to comply with the requirements of Clause 18.9, every Contractor shall take suitable and sufficient steps to prevent any person being struck by any falling material or object which is liable to cause personal injury & damage to the property of third party.

18.10.3 The Contractor shall ensure that no material or object is thrown or tipped from height in circumstances where it is liable to cause injury to any person and the property of third party.

18.10.4 Every Contractor shall ensure that materials and objects are stored in such a way as to prevent risk to any person arising from the collapse, overturning or unintended movement of such materials or objects.

#### **18.11 Danger areas**

18.11.1 Without prejudice to the preceding requirements of these Regulations, every Contractor shall ensure that,

- (i) Where a workplace contains an area in which, owing to the nature of the work, there is a risk of any person at work;
  - a. falling a distance; or
  - b. being struck by a falling object,

which is liable to cause personal injury, the workplace is so far as is reasonably practicable equipped with devices preventing unauthorised persons from entering such area; and

- (ii) such area is clearly indicated.

#### **18.12 Inspection of work equipment**

18.12.1 The Contractor shall ensure that, where the safety of work equipment depends on how it is installed or assembled, it is not used after installation or assembly in any position unless it has been inspected in that position.

18.12.2 The Contractor shall ensure that work equipment exposed to conditions causing deterioration which is liable to result in dangerous situations is inspected

- (i) at suitable intervals; and
- (ii) each time that exceptional circumstances which are liable to jeopardise the safety of the work equipment have occurred,

to ensure that health and safety conditions are maintained and that any deterioration can be detected and remedied in good time.

18.12.3 Without prejudice to Clause 18.12.1, the Contractor shall ensure that a working platform

- (i) used for construction work; and
- (ii) from which a person could fall 2 metres or more,

is not used in any position unless it has been inspected in that position or, in the case of a mobile working platform, inspected on the site, within the previous 7 days.

18.12.4 The Contractor shall ensure that the reports of all inspections are properly maintained and shown to the Employer as and when required.

18.12.5 **In this clause "inspection",**

- (i) means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes; and
- (ii) includes any testing appropriate for those purposes,

### **18.13 Inspection of places of work at height**

The Contractor shall so far as be reasonably practicable ensure that the surface and every parapet, permanent rail or other such fall protection measure of every place of work at height are checked on each occasion before the place is used.

### **18.14 Duties of persons at work**

18.14.1 Any workmen employed by the Contractor shall report to the supervisor about any defect relating to work at height which he knows is likely to endanger the safety of himself or another person.

18.14.2 Every workman shall use any work equipment or safety device provided to him for work at height by the Contractor, in accordance with:

- (i) any training in the use of the work equipment or device concerned which have been received by him; and
- (ii) the instructions respecting that use which have been provided to him by the Contractor as per the requirements of the Employer

18.15 Requirements for existing places of work and means of access or egress at height

Every existing place of work or means of access or egress at height shall:

- (i) be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used;
- (ii) where applicable, rest on a stable, sufficiently strong surface;

- (iii) be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work to be carried out there;
- (iv) possess suitable and sufficient means for preventing a fall;
- (v) possess a surface which has no gap
  - a. through which a person could fall;
  - b. through which any material or object could fall and injure a person; or
  - c. giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk;
- (vi) be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable:
  - a. the risk of slipping or tripping; or
  - b. any person being caught between it and any adjacent structure;
- (vii) where it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

#### 18.16 Requirements for guardrails, toe-boards, barriers and similar collective means of protection

- (i) Unless the context otherwise requires, any reference in this section to means of protection is to a guardrail, toe-board, barrier or similar collective means of protection.
- (ii) Means of protection shall
  - a. be of sufficient dimensions, of sufficient strength and rigidity for the purposes for which they are being used, and otherwise suitable;
  - b. be so placed, secured and used as to ensure, so far as is reasonably practicable, that they do not become accidentally displaced; and
  - c. be so placed as to prevent, so far as is practicable, the fall of any person, or of any material or object, from any place of work.
- (iii) In relation to work at height involved in construction work
  - a. the top guard-rail or other similar means of protection shall be at least 950 millimetres above the edge from which any person is liable to fall;
  - b. toe-boards shall be suitable and sufficient to prevent the fall of any person, or any material or object, from any place of work; and
  - c. any intermediate guardrail or similar means of protection shall be positioned so that any gap between it and other means of protection does not exceed 470 millimetres.
- (iv) Any structure or part of a structure which supports means of protection or to which means of protection are attached shall be of sufficient strength and suitable for the purpose of such support or attachment.

#### 18.17 Requirements for all Working Platforms

- (i) Every working platform requires a supporting structure for holding it
- (ii) Any surface upon which any supporting structure rests shall be stable, of sufficient strength and of suitable composition safely to support the supporting structure, the working platform and any loading intended to be placed on the working platform.

(iii) Stability of supporting structure

Any supporting structure shall

- a. be suitable and of sufficient strength and rigidity for the purpose for which it is being used;
- b. in the case of a wheeled structure, be prevented by appropriate devices from moving inadvertently during work at height;
- c. in other cases, be prevented from slipping by secure attachment to the bearing surface or to another structure, provision of an effective anti-slip device or by other means of equivalent effectiveness;
- d. be stable while being erected, used, and dismantled; and
- e. when altered or modified, be so altered, or modified as to ensure that it remains stable.
- f. Have suitable base plates and properly footed thereby.

(iv) Stability of working platforms

A working platform shall

- a. be suitable and of sufficient strength and rigidity for the purpose or purposes for which it is intended to be used or is being used;
- b. be so erected and used as to ensure that its components do not become accidentally displaced so as to endanger any person;
- c. when altered or modified, be so altered, or modified as to ensure that it remains stable; and
- d. be dismantled in such a way as to prevent accidental displacement.

(v) Safety on working platforms

A working platform shall

- a. be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used and to provide a safe working area having regard to the work being carried out there;
- b. possess a suitable surface and, in particular, be so constructed that the surface of the working platform has no gap
  - 1. through which a person could fall;
  - 2. through which any material or object could fall and injure a person; or
  - 3. giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk; and
- c. be so erected and used, and maintained in such condition, as to prevent, so far as is reasonably practicable
  - 1. the risk of slipping or tripping; or
  - 2. any person being caught between the working platform and any adjacent structure.

(vi) Loading

A working platform and any supporting structure shall not be loaded so as to give rise to a risk of collapse or to any deformation, which could affect its safe use.

(vii) Additional requirements for scaffolding

Strength and stability calculations for scaffolding shall be carried out unless

- a. a note of the calculations, covering the structural arrangements contemplated, is available; or
  - b. it is assembled in conformity with a generally recognised standard configuration.
- (viii) Depending on the complexity of the scaffolding selected, a competent person shall draw up an assembly, use and dismantling plan. This may be in the form of a standard plan, supplemented by items relating to specific details of the scaffolding in question.
- (ix) A copy of the plan, including any instructions it may contain, shall be kept available for the use of persons concerned in the assembly, use, dismantling or alteration of scaffolding until it has been dismantled.
- (x) The dimensions, form and layout of scaffolding decks shall be appropriate to the nature of the work to be performed and suitable for the loads to be carried and permit work and passage in safety.
- (xi) While a scaffold is not available for use, including during its assembly, dismantling or alteration, it shall be marked with general warning signs in accordance with and be suitably delineated by physical means preventing access to the danger zone.
- (xii) Scaffolding may be assembled, dismantled, or significantly altered only under the supervision of a competent person and by persons who have received appropriate and specific training in the operations envisaged which addresses specific risks which the operations may entail and precautions to be taken, and more particularly in:
- a. understanding of the plan for the assembly, dismantling or alteration of the scaffolding concerned;
  - b. safety during the assembly, dismantling or alteration of the scaffolding concerned;
  - c. measures to prevent the risk of persons, materials or objects falling;
  - d. safety measures in the event of changing weather conditions which could adversely affect the safety of the scaffolding concerned;
  - e. permissible loadings;
  - f. any other risks which the assembly, dismantling or alteration of the scaffolding may entail.

#### **18.18 Requirements for collective safeguards for arresting falls**

- (i) Collective safeguard is a safety net, airbag or other collective safeguard for arresting falls
- (ii) A safeguard shall be used only if
- a. a risk assessment has demonstrated that the work activity can so far as is reasonably practicable be performed safely while using it and without affecting its effectiveness;
  - b. the use of other, safer work equipment is not reasonably practicable; and
  - c. a sufficient number of available persons have received adequate training specific to the safeguard, including rescue procedures.
- (iii) A safeguard shall be suitable and of sufficient strength to arrest safely the fall of any person who is liable to fall.
- (iv) A safeguard shall:
- a. in the case of a safeguard which is designed to be attached, be securely attached to all the required anchors, and the anchors and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of safely supporting the foreseeable loading in arresting any fall and during any subsequent rescue;
  - b. in the case of an airbag, landing mat or similar safeguard, be stable; and
  - c. in the case of a safeguard, which distorts in arresting a fall, afford sufficient clearance.

- (v) Suitable and sufficient steps shall be taken to ensure, so far as practicable, that in the event of a fall by any person the safeguard does not itself cause injury to that person.

#### **18.19 Requirements for personal fall protection systems**

- (i) A personal fall protection system shall be used only if
  - a. a risk assessment has demonstrated that
    - 1. the work can so far as be reasonably practicable be performed safely while using that system; and
    - 2. the use of other safer work equipment is not reasonably practicable; and
  - b. the user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.
- (ii) A personal fall protection system shall
  - a. be suitable and of sufficient strength for the purposes for which it is being used having regard to the work being carried out and any foreseeable loading;
  - b. where necessary, fit the user;
  - c. be correctly fitted;
  - d. be designed to minimise injury to the user and, where necessary, be adjusted to prevent the user falling or slipping from it, should a fall occur; and
  - e. be so designed, installed, and used as to prevent unplanned or uncontrolled movement of the user.
- (iii) A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment thereto shall be suitable and of sufficient strength and stability for the purpose of supporting any foreseeable loading.
- (iv) Suitable and sufficient steps shall be taken to prevent any person falling or slipping from a personal fall protection system.
- (v) All fall protection system should be inspected weekly as a minimum.

#### **18.20 Requirements for Ladders**

- (i) Every Contractor shall ensure that a ladder is used for work at height only if a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk and
  - a. The short duration of use; or
  - b. Existing features on site, which he cannot alter.
- (ii) Only metal ladders shall be allowed. Bamboo ladders are prohibited.
- (iii) Any surface upon which a ladder rests shall be stable, firm, of sufficient strength and of suitable composition safely to support the ladder so that its rungs or steps remain horizontal, and any loading intended to be placed on it.
- (iv) A ladder shall be so positioned as to ensure its stability during use
- (v) A suspended ladder shall be attached in a secure manner and so that, with the exception of a flexible ladder, it cannot be displaced and swinging is prevented.
- (vi) A portable ladder shall be prevented from slipping during use by:

- a. securing the stiles at or near their upper or lower ends;
  - b. an effective anti-slip or other effective stability device; or
  - c. any other arrangement of equivalent effectiveness.
- (vii) A ladder used for access shall be long enough to protrude sufficiently above the place of landing to which it provides access, unless other measures have been taken to ensure a firm handhold.
  - (viii) No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.
  - (ix) A mobile ladder shall be prevented from moving before it is stepped on.
  - (x) Where a ladder or run of ladders raises a vertical distance of 9 metres or more above its base, there shall, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.
  - (xi) Every ladder shall be used in such a way that
    - a. a secure handhold and secure support are always available to the user; and
    - b. the user can maintain a safe handhold when carrying a load unless, in the case of a step ladder, the maintenance of a handhold is not practicable when a load is carried, and a risk assessment has demonstrated that the use of a stepladder is justified because of
      - 1. the low risk; and
      - 2. the short duration of use.
  - (xii) Ladders should be inspected weekly for any damage or corrosion.

## 18.21 Detailed requirements for Scaffolding

### 18.21.1 Scaffold General

This procedure provides general information about the competent person, erection, inspection, and use of both welded-frame and tube-and-coupler scaffolds.

- (i) Scaffolds are intended to provide safe working positions at elevations. To eliminate fall exposures, scaffolds must have complete handrails, mid-rails, and decking. Do not use fall arrest equipment as a substitute for handrails, mid-rails, or a complete deck.
- (ii) Before erecting scaffolds, consider all nearby or overhead hazardous energy sources such as electrical, mechanical, pneumatic, thermal, and chemical.
- (iii) Welded-frame scaffolds are made of basic prefabricated end frames, cross-bracing, and frame-connecting devices to hold the parts firmly in place. Tube and-coupler and system scaffolds are made of various lengths of tubing clamped together by special patented couplers to support working platforms of various shapes.
- (iv) All complete scaffolds will have a top handrail approx. 1.1 meter above the platform, mid rail approx. 0.6 meter above the platform and a toe plate 10 cm tall from the platform.
- (v) Do not inter mix scaffold components manufactured by different manufacturers unless the component parts fit together without force or modification.
- (vi) Bamboo components are not permitted on Maha-Metro Sites.

**Competent person:** one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt, corrective measures to eliminate those.



**Qualified person:** one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve or resolve problems related to the subject matter, the work, or the project.

### 18.21.2 Erecting Scaffolds

- (i) Only employees who have been trained by and are under the supervision of a competent person will erect scaffolds. The Maha-Metro Project Safety Manager must approve scaffolds higher than 50 feet (15 meters) above the base plates.
- (ii) Where fall hazards cannot be eliminated, use fall-arrest systems while erecting, modifying, and dismantling scaffolds. It is the responsibility of the competent person to determine the feasibility and type of fall-arrest system to be used.
- (iii) Set scaffold legs on base plates placed on foundations or mudsills that are adequate for supporting the maximum intended loads. Scaffold boards and
- (iv) masonry blocks are not appropriate scaffold foundations. The total load on a scaffold consists of the sum of the weight of the workers and materials on a scaffold plus the weight of the scaffold.
- (v) Install adjusting screws only between the base plate and the vertical frame section. Never use adjusting screws together with casters. Do not extend adjusting screws beyond 12 inches (30 centimetres).
- (vi) The position and number of braces used on a scaffold not only restricts the amount of side movement, but also determines the strength of the scaffold. Never use cross-braces as substitutes for handrails or mid rails.
- (vii) When the height of a scaffold exceeds three times the smallest width of the base, secure it to the building or structure at every other lift and every 9 meters horizontally. The scaffold should be secured by both ties and braces to prevent movement. Equip scaffold working platforms with handrails approximately one-meter high, mid rails, and toe boards, all secured rigidly. Working platforms should be completely decked with safety planks, manufactured scaffold decking, or laminated wooden planks.
- (viii) To allow access to the working platform of a tubular welded frame scaffold, the ladder built into the end frames can be used if it has been specifically designed and constructed by the manufacturer for the purpose of access.
- (ix) Employees engaged in erecting or dismantling tubular-welded frame scaffolds may use the end-frame horizontal members for access provided they are parallel, level, and are not more than 22 inches apart vertically. Hook-on attachable ladders shall be installed as soon as scaffold erection has progressed to a point that permits safe installation and use. Consideration should be given to breaking the ladder at approximately 6-meter intervals. Retractable or vertical lifelines should be used for fall protection while climbing more than 20-feet.
- (x) When portable straight or extension ladders are used for access to tube-and coupler scaffolds, the 4-to-1 slope should be maintained to avoid a horizontal tube interfering with the use of the ladder.
- (xi) Scaffold users should be able to step off the scaffold access ladder directly onto the working platform. Provide entry gates for scaffolds to eliminate the need for users to climb over handrails.
- (xii) Tag or otherwise identify scaffolds that should not be occupied or that require particular safety precautions. The tag should indicate special requirements, the date of erection, and the signature of the competent person.

- (xiii) Scaffolds and their components must be capable of supporting, without failure, at least four times the maximum intended load. Materials should be evenly distributed on platforms and not concentrated in one small area.
- (xiv) During erection of scaffolds, the electrical clearances shall be maintained as per the tabulation mentioned herein in this document

#### **18.21.3 Scaffold Inspection**

- (i) A competent person shall visually inspect all components of the scaffold for defects prior to each shift's use and following any occurrence that could affect the scaffold's structural integrity. Defective components will be immediately discarded.
- (ii) Before erecting and while dismantling scaffolds, inspect all components. Scaffold components should be straight and free from bends, kinks, dents, and severe rusting. Immediately discard defective components. Inspections should include an evaluation of the following components:
  - a. Handrails, mid-rails, toe boards, cross-bracing and steel tubing for nicks and other damage, especially near the centre span, and for signs that welding arcs may have struck the equipment
  - b. weld zones on the scaffold frame for cracks
  - c. the end of tubing for splits or cracks
  - d. manufactured decks for loose bolts or rivet connections and bent, kinked, or dented frames
  - e. safety planks for rot, cracks, cuts, and other external damage
  - f. tie rods or bolts and angle iron cleats
  - g. cams, springs, threaded connection, toggle pins, or other quick-connecting devices
  - h. Casters for rough rolling surfaces, "sticky" swivels, and defective locking mechanisms.
- (iii) Scaffold Inspection Tag, Boards, identifying that the scaffold is "Safe for Use" or "Scaffolds Under Construction" must be attached to all scaffolds.

#### **18.21.4 Scaffold Training**

- (i) Employees involved in the erection, dismantling, moving, repairing, etc., of scaffolding shall receive training from a competent person. The purpose of the training is to recognize any hazards associated with the work in question. Training shall consist of:
  - a. The nature of scaffold hazards
  - b. The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold.
  - c. The design criteria, maximum intended load-carrying capacity, and intended use of the scaffold.
- (ii) Employees who perform work while on a scaffold shall be trained by a qualified person so they will recognize hazards associated with the type of scaffold being used and understand the procedures to control those hazards. Training will cover the following topics as necessary:
  - a. The nature of any electrical hazards, fall hazards, and falling object hazards in the work area.
  - b. The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling the fall protection systems and falling object protection systems used.
  - c. The proper use of the scaffold and the proper handling of materials on the scaffold.
  - d. The maximum intended load and the load-carrying capacities of the scaffolds used.

#### **18.21.5 Suspended Scaffolding**

Swinging stages, toothpicks, boatswain chairs, float, and needle beams require special approval prior to use.

Attach and secure safety harness before stepping on these scaffolds and do not remove until clear of the scaffold. Tie off to independent lifeline or building structure. One lifeline per person.

### 18.22 Provision of safety nets

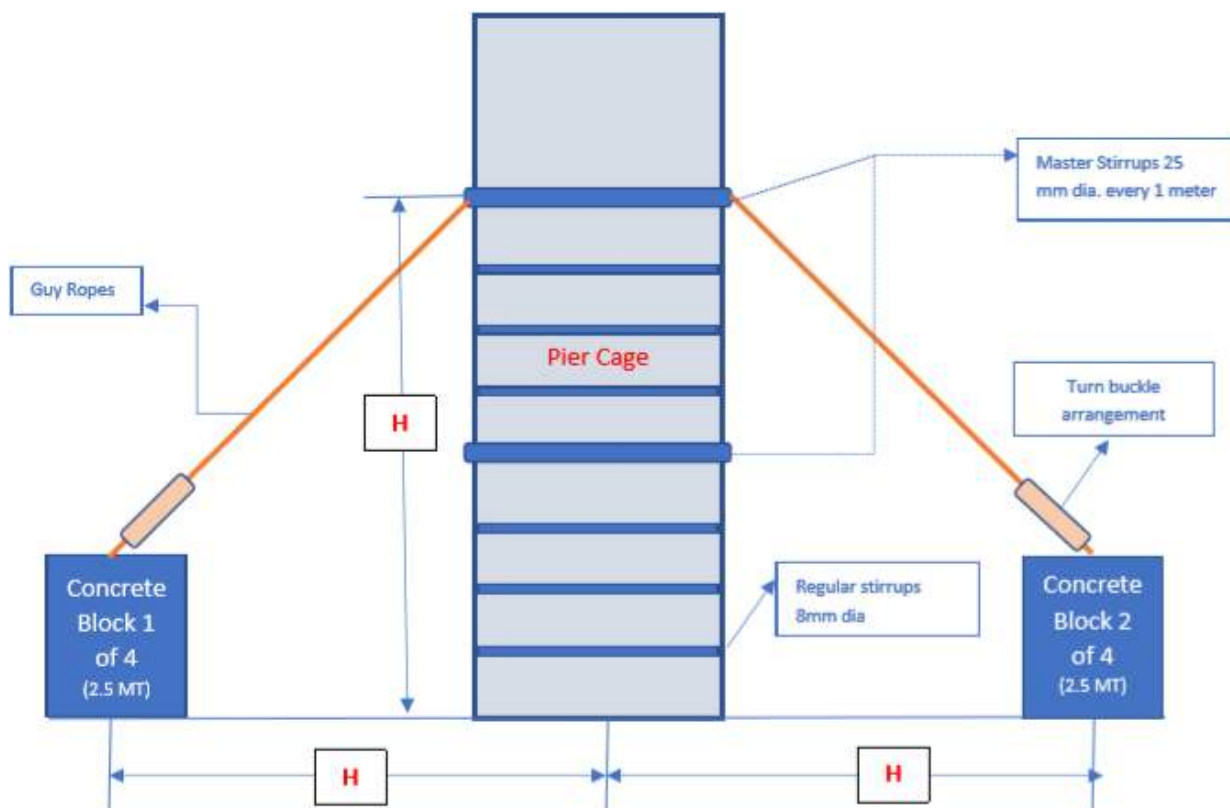
Garware make/Equivalent to safety nets have to be provided at all the locations where there is free fall of men/materials from the site to the live road or ground floor. Double/Triple layer safety nets has to be provided without fail

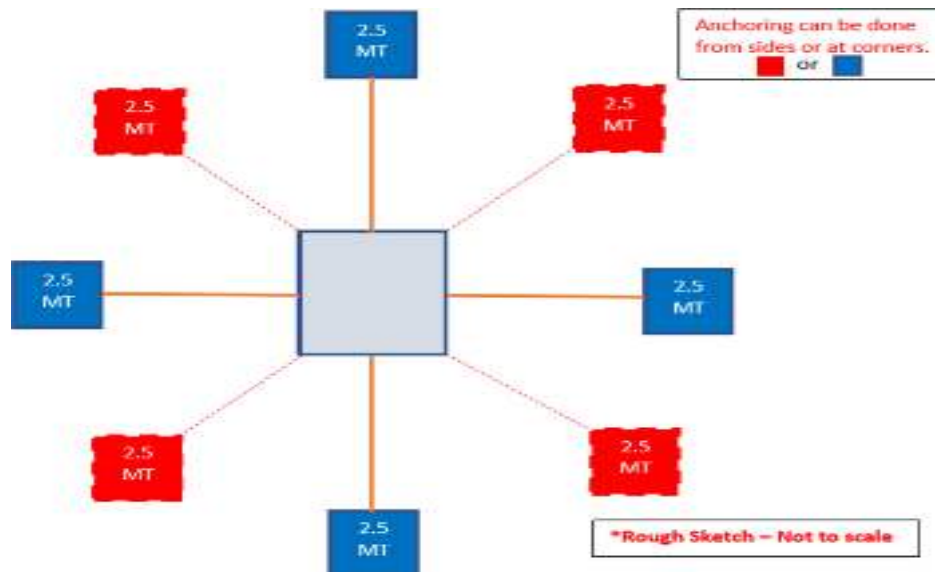
### 18.23 Pier Reinforcement Cage Protection

Tying of Pier reinforcement should be done as per sketch A. wherever due to space constraint, it is desirable that two cranes should be used; one to hold the pier reinforcement and the other one to erect the shuttering.

1. 25mm dia. master stirrup to be installed every 1 m height, in addition to regular stirrups.
2. Master stirrup need to be used to anchor the pier cage with guy ropes at four sides. Concrete blocks (2.5 MT) shall be placed in such a way that the guy ropes make an angle of  $45^\circ$  with the ground. (refer attached sketch A)
3. For all pier reinforcement / shuttering works more than 6m height, advance RFI along with safety inspection checklist must be raised for permission of GC personnel for de-staging of support and placement of shuttering

#### Typical Sketch A - Pier cage - Concrete blocks placement & anchorage method





## 19.0 OVERHEAD PROTECTION

- 19.1 All contractors shall provide overhead protections as per Rule 41 of BOCWR.
- 19.2 Overhead protection should be erected along the periphery of every building which is under construction and the building height shall be 15m or above after construction.
- 19.3 Overhead protection shall be minimum 2m wide and the outer edge shall be 150mm higher than the inner edge and an angle not more than 20° to its horizontal sloping into the building.
- 19.4 Overhead protection shall not be erected more than a height of 5m from the base of the building.
- 19.5 Areas of inadvertent hazard of falling of material shall be guarded or barricaded or roped-off thereby by the Contractor.

## 20.0 SLIPPING, TRIPPING, CUTTING, DROWNING AND FALLING HAZARDS

As per Rule 42 of BOCWR:

- 20.1 All places should be free from dust, debris or similar materials.
- 20.2 Sharp projections or any protruding nails or similar objects shall be suitably guarded or shall even be avoided to make the place safe to work.
- 20.3 Contractor shall not allow workmen to work or use platforms, scaffolds/passageways or any walkways, which has water, or oil or similar substances spilt and has a slipping hazard, unless it is cleaned off or covered or sanded or saw dusted or make it safe with any suitable material.
- 20.4 When workers are exposed to areas where fall into water is possible, the Contractor shall provide suitable and adequate equipment for saving the workers from drowning and rescuing from such hazard. If the Employer considers, the Contractor shall provide well-equipped boat or launch, manned with trained personnel at the work place.
- 20.5 Open side or opening where worker, equipment, vehicle or lifting appliance may fall at a building or outside shall be guarded suitably except in places of free access by reasons of nature of work.

- 20.6 Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.
- 20.7 The collapse of formwork in the construction industry has the potential for severe injury and death. The four stages of the use of formwork (erection, adjustment, concrete placement and dismantling) all need to be managed in a risk assessment framework. Implementing suitable control measures can eliminate or reduce the potential for events such as the collapse of formwork. Suitable control measures include:
- I. keeping the documentation for the formwork at the workplace;
  - II. following the formwork documentation;
  - III. planning to ensure that all elements of the process are conducted in a safe manner – e.g., ensuring operators such as crane operators, concrete placers are suitably licensed and trained, appropriate personal protective equipment is used etc;
  - IV. erecting the formwork on foundations which will support the loads to be imposed on the formwork;
  - V. not erecting formwork near excavation;
  - VI. ensuring materials used in the erection of formwork are not defective;
  - VII. securing loose material which may be dislodged as a result of inclement weather;
  - VIII. inspecting the formwork assembly before and during the placement of concrete;
  - IX. not attaching equipment to the formwork assembly unless specifically designed for this purpose; and not using a stripping process which may cause damage to the permanent structure.

## **21.0 LIFTING APPLIANCES AND GEAR**

- 21.1 Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, lifting machinery sheaves, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyenuts and other accessories of a lifting appliance.
- 21.2 No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:
- I. the weights, dimensions, and lift radius of the heaviest and largest loads
  - II. the maximum lift height, the maximum lift radius and the weight of the loads that must be handled at each lifting operation.
  - III. Proper mockup without load trials shall be carried out for heavy duty lifting operations by crane before resorting to the actual lifting of the load.
  - IV. the number and frequency of lifts to be made and maintained in Lifting Register.
  - V. how long the crane will be required on site to be ensured by lifting team.
  - VI. the type of lifting to be done (for example, is precision placement of loads important?)
  - VII. the type of carrier required (this depends on ground conditions and machine capacity in its operating quadrants) capacity is normally greatest over the rear, less over the side, and non-existent over the front
  - VIII. whether loads will have to be walked or carried
  - IX. whether loads will have to be suspended for lengthy periods
  - X. the site conditions, including the ground where the machine will be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation.

- XI. Method Statement with attached Risk Assessment, Lifting Plan, lifting method drawing/sketch and the list of Competent Lifting Team/Responsible Person shall be submitted to employer well in advance as mentioned herein before at Clause 3.5.2.
- XII. Pre-lifting Toolbox-Talk must be conducted before lifting operation with listed Lifting team ensuring their roles and responsibilities in lifting operation.
- 21.3 The Contractor shall ensure that a valid certificate of fitness issued as per Clause 21.5 is available for all lifting appliances including synchronised mobile jacks, pre-stressing hydraulic jacks, jacks fitted with launching girders etc. and Employer's approval before inducting to the site. Only after obtaining the approval from the Employer any lifting appliances and gear shall be used.
- 21.4 The laminated photocopies of fitness certificate issued by competent person, the Employers' approval letter, the operators' photo, manufacturer's load chart and competency certificate shall always be either kept in the operator cabin or pasted on the visible surface of the lifting appliances.
- 21.5 All lifting appliances and loose gears shall be clearly marked for its safe working load and identification by stamping or other suitable means.
- 21.6 The Contractor shall also maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.
- 21.7 Test and periodical examination of lifting appliances and gears
- 21.7.1 All lifting appliances including all parts and gears thereof, whether fixed or movable shall be thoroughly tested and examined by a competent person once at least in every six months or after it has undergone any alterations or repairs liable to affect its strength or stability. Within the validity, if the lifting appliances are shifted to a new site, re-examination by the same competent person for ensuring its safety shall also be done.
- 21.7.2 Contractors can utilise the services of any competent person as defined in Factories Act, 1948 and approved by Chief Inspector of Factories with the permission of the Employer.
- 21.7.3 All alarms and signals like Automatic Safe Load Indicators (ASLI), boom angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition.
- 21.8 Automatic Safe Load Indicators
- 21.8.1 As stipulated in relevant Rule of GBOCWR 2003, no lifting appliances gear or any other material handling appliance is used, if:
- (i) the Inspector having jurisdiction is not satisfied with reference to a certification of test or examination or to an authenticated record maintain as provided under these rules; and
  - (ii) in the view of such Inspector, the lifting appliance, lifting gear or any other material handling appliance is not safe for use in building or other construction work; and
  - (iii) no pulley block is used in building or other construction work unless the safe working load and its identification are clearly marked on such block.
- 21.8.2 All lifting appliances and gears, like cranes, hydras etc, if so constructed that the safe working load may be varied by raising or lowering of the jib or otherwise shall be attached with an automatic indicator of safe working loads approved by Bureau of Indian standards/ International

certifying bodies which gives a warning to the operator and arrests further movements of the lifting parts.

#### 21.9 Qualification of operator of lifting appliances and of signaller etc.

21.9.1 The Contractor shall not employ any person to drive or operate a lifting machine like crane, hydra etc whether driven by mechanical power or otherwise or to give signals to work as a operator of a rigger or derricks unless he:

- (i) is above twenty-one years of age and possesses a valid heavy transport vehicle driving licence as per Motor Vehicle Act and Rules.
- (ii) is absolutely competent and reliable
- (iii) possesses the knowledge of the inherent risks involved in the operation of lifting appliances by undergoing a formal training at any institution of national importance acceptable to Employer
- (iv) is medically examined periodically as specified in Schedule VII of BOCW Rules.

#### 21.10 General requirements of appliances

##### 21.10.1 Out-of level

One of the most severe effects of being out-of fit level is that side loads develop in the boom. Because of side loads all mobile cranes lose capacity rapidly as the degree of out-of-level increases and therefore control of out-of-level is of utmost importance.

##### 21.10.2 Boom

- (i) The boom is one of the more critical elements of the crane and must be in perfect condition at all time. No boom section with a bent lattice member shall be allowed
- (ii) All welds shall be crack and corrosion free
- (iii) No member of the boom shall be bent
- (iv) All telescopic boom shall be free from cracks, rust, flaking or cracked paint, bulges, greases or varnishes

21.10.3 The sweep area (work area) of the construction machinery shall be always free from obstructions.

21.10.4 All hydraulic piping and fittings shall be maintained leak proof.

21.10.5 The operator cab shall posses good and safe:

- (i) structure, windows, and windshield wipers
- (ii) Drivers chair and foot rest
- (iii) Control handles
- (iv) Cab instrumentation
- (v) Telecommunication
- (vi) Cab out fitting
- (vii) wind indicator with an adjustable set point shall be in a position representative for the wind on the crane. The indicator shall give continuous information regarding constant speeds and gusts.

#### 21.11 Mandatory rigging requirements

21.11.1 Rigging shall be done under experienced and qualified rigger only.

- 21.11.2 The primary requirement in rigging shall be to assess the weight of load before attempting any lift.
- 21.11.3 All hooks shall be fitted with Master Rings having certificate of fitness from the competent person, so that the hooks are subjected to balanced vertical loading only.
- 21.11.4 Only four legged slings shall be allowed which includes master link (ring), intermediate master link (ring) if necessary, chain / wire rope sling, sling hook or other terminal fitting.
- 21.11.5 Hand spliced slings up to 32mm diameter shall not be used at site for any lifting purpose.
- 21.11.6 No load shall be slewed over public areas without stopping the pedestrians and road traffic first.
- 21.11.7 Requirements of outriggers
- (i) All outriggers shall be fully extended and all tyres are clear of the ground
  - (ii) Heavy duty blocking having large bearing area shall be necessary to prevent sinking of floats
- 21.11.8 All loads shall have tag-lines attached in order to ensure that the load can be controlled at all times.
- 21.11.9 No close working to any live overhead power line is permitted without the operation of a strict Permit to Work.
- 21.11.10 Minimum lighting is to be ensured at all lifting operations.
- 21.11.11 Usage of First-Generation Hydra is STRICTLY PROHIBITED in Pune Metro project, if found violated, penalty shall be imposed without any warning letter.
- 21.11.12 Crane used for lifting operations shall not be older than 10 years, in case of tyre mounted and 15 years in case of crawler mounted.
- 21.12 Failure to do any of the above shall attract penalty from the Employer as per relevant clause

## **22.0 LAUNCHING OPERATION**

- 22.1 As launching operation is one of the riskiest jobs, the Contractor shall take utmost precaution at all stages like; planning, establishing casing yard, casting segments, transporting segments, fabrication and erection of launching girders, launching of segments, pre-stressing, auto launching of girders and dismantling of launching girders.
- 22.2 The Contractor shall prepare a comprehensive Method Statement for the launching operation, adhering to the SHE conditions laid down in conditions of contract on SHE and Project SHE Manual. Particular reference shall be made to the provisions on working at height. As the entire process of launching has to be undertaken at an elevated level, the safety of workers and the girder is paramount important. The following general guidelines shall be adhered throughout the launching operation.
- (i) Necessary 'working platforms' and fall protection anchorage arrangement shall be provided in the launching girder itself.
  - (ii) Provisions for mounting light fittings shall also be made available in the launching girder.
  - (iii) The casting yard shall be established ensuring the provision given in Clause 38.0
  - (iv) The workmen engaged in fabrication of reinforcement, concreting the segment shall be provided with necessary PPEs including compulsory hand protection gloves.



- (v) Casting and curing of segment shall be undertaken under the direct supervision of the responsible engineer of the Contractor.
- (vi) Trucks with valid registration, licence, safe worthiness certificate, Employer's approval certificate, and pollution under check certificate shall only be used for transport of segments.
- (vii) All vehicle drivers including heavy vehicle operators shall be trained on defensive driving at training institute recognized by Maharashtra State Road Transport Corporation / Government of Maharashtra, or any other driving institute registered under Motor Vehicles Act.
- (viii) Drivers shall also have undergone proper medical examination as per relevant clause mentioned under 'Medical Facilities.'
- (ix) The segments shall be rigidly secured to the truck with necessary wooden wedges and necessary red indicators/safety tapes provided so that the vehicle is clearly seen by other road users both in day / night time. Further, necessary arrangements / modification should be made in the trailer and Engineer / Employer approval shall be obtained before the transportation starts.
- (x) Every launching girder shall have a responsible engineer on duty all the time.
- (xi) All the time from erection to dismantling the area between the two piers wherein launching is in progress shall always be barricaded.
- (xii) Unloading of segments from trucks, lifting of segments, shifting of segments, gluing shall be done under the direct supervision of the approved engineer of the Contractor.
- (xiii) Auto launching shall be done only after approval from the Employer. After every auto launching the stability of launching girder shall be ensured.
- (xiv) The vertical deflection of launching girder shall be monitored at all critical stages like with/without loads and after every auto launching.
- (xv) A register containing all important operational details from erection to dismantling of launching girders shall be maintained and made available to Employer whenever called for.
- (xvi) Test certificate for all lifting gears including Macalloy bars shall be maintained at a location closer to the launching girder itself so that it can be referred during all inspections.
- (xvii) Adequate lighting at all time shall be ensured in the entire area of operation.
- (xviii) Access to drinking water & toilet shall be ensured to all workmen engaged for launching process.
- (xix) Proper access ladders/stairways shall be maintained for safe ascending / descending of workmen / engineers.

22.3 Non-adherence to any of the clauses mentioned above shall be viewed seriously by the Employer and penalty levied as per relevant clause.

## **23.0 CONSTRUCTION MACHINERY**

- 23.1 Construction machineries may include dumpers and dump trucks, lift trucks and telescopic handlers piling rigs, vibro hammers, rail welding equipments, mobile elevating work platforms, cranes, tipper lorries, lorry loaders, skip wagons, 360° excavators, 180° backhoe loaders, crawler

tractors, scrapers, graders, loading shovels, trenchers, side booms, pavers, planers, chippers, road rollers, locomotives, tankers and browsers, trailers, hydraulic and mechanical breakers etc.

## 23.2 Safe worthiness certificate

23.2.1 Every construction equipment shall be in sound mechanical working condition and certified by either competent person under Factories Act or manufacturers' warranty in case of brand new equipments or authorized persons / firms approved by Employer before induction to any site.

23.2.2 Every such certificate shall have the date of purchase, main overhauling undertaken in the past, any accident to the equipment, visual examination details, critical components safety check, list of safety devises and its working condition, manufacturer's maintenance checklist, past projects wherein the equipments were used etc as its minimum content.

## 23.3 Reverse Horns and reverse cameras

All Vehicles shall be fitted with audible reverse alarms and reverse cameras, maintained in good working condition. Reversing shall be done only when there is adequate rear-view visibility or under the directions of a banks man

## 23.4 General operating procedures

- (i) Drivers entering site shall be instructed to follow the safe system of work adopted on site. These shall be verbal instructions or, preferably, written instructions showing the relevant site rules, the site layout, delivery areas, speed limits, etc.
- (ii) No passengers shall be carried, unless specific seating has been provided in accordance with the manufacturers' recommendations.
- (iii) Working on gradients beyond any equipments capability shall not be allowed.
- (iv) Prevention of dumper and dump truck accidents should be managed by providing wheel stops at a sufficient distance from the edges of excavations, spoil heaps, pits, etc.
- (v) The manufacturer's recommended bucket size must not be exceeded in excavators.
- (vi) If excavators operating on a gradient which cannot be avoided, it must be ensured that the working cycle is slowed down, that the bucket is not extended too far in the downhill direction, and that travel is undertaken with extreme caution. A large excavator must never be permitted to travel in a confined area, or around people, without a banks man to guide the driver, who should have the excavator attachment close in to the machine, with the bucket just clear of the ground. On wheeled excavators, it is essential that the tyres are in good condition and correctly inflated. If stabilizing devices are fitted, they should be employed when the machine is excavating.
- (vii) When the front shovel of the 180° backhoe loaders is being employed, the backhoe attachment shall be in its "travel" position, with the safety locking device in place.
- (viii) When operating the backhoe in poor ground conditions, the stabilisers tend to sink into the surface of the ground, reducing stability. Therefore, frequent checks shall be made for the stability of the machine. The loading shovel should always be lowered to the ground to stabilise the machine when the backhoe is employed.
- (ix) The netting operation of the skip wagons should be carried out prior to lifting the skip to reduce the risks of working on the rear platform.
- (x) If a tractor dozer is employed on clearing scrub or felling trees, it shall be provided with adequate driver protection.

- (xi) When two or more scrapers are working on the same job, a minimum distance of at least 25m shall be kept between them.
  - (xii) In case of hydraulic breakers, hydraulic rams and hoses shall be in good working condition
- 23.5 All wood working machines shall be fitted with suitable guards and devices such as top guard, riving knife, push stick, guards for drive belts and chains, and emergency stop switch easily accessible by the operator.
- 23.6 Requirements related to use of Bulldozers
- 23.6.1 General
- (i) Be careful when working near the edge of banks, ditches, cuts, or fills, or near overhanging material. The vibration and weight of the machine may cause the edge to give way or overhanging material to fall.
  - (ii) Before starting work, ensure that an observer is present when plant is required to work in water where the depth may endanger the operator.
  - (iii) Avoid obstacles such as rocks or logs. If forced to cross them, use extreme caution, and change to the lowest gear.
  - (iv) Ease up to the balance point and ease down to minimise the jolt on contact with the other side.
  - (v) When receiving a wire rope on a drum or through Sheaves, operators should disengage the master clutch, idle the engine, and lock the brakes.
- NOTE: All operators should stop engines before working with ropes wound on front-mounted drums.
- 23.6.2 Clearing Operations
- (i) When clearing trees, watch out for dead branches in treetops.
  - (ii) Dozer operators should make sure that all persons are standing clear before pushing over trees, dozing rocks or rolling logs.
  - (iii) A long rope should be used to pull over large dead trees. (Make sure in advance that a falling tree will clear the machine and operator).
  - (iv) In excavation work, operators should be alert to dangers from overhanging dirt and rocks. In such cases, dozers should be equipped with the relevant overhead protection.
- 23.7 Requirements related to use of Excavators
- (i) When excavating trenches, place the excavated material at a distance of one and a half times the depth of the trench from the edge of that trench. Where this is not practicable, place excavated materials at least one (1) metre from the edge of the trench.
  - (ii) Ensure the ground beneath the machine is not undercut.
  - (iii) Watch boom clearance when travelling. Uneven ground may cause the boom to weave and collide with obstructions.
  - (iv) Avoid jerky slewing or sudden braking. These can make the machine unstable and overload machine components.

- (v) Ensure the operator has the appropriate restricted operator's licence if the excavator is to be used in the crane mode.
- (vi) When an excavator is used in the crane mode, check that the lifting weight is well within the approved lifting capacity for the machine. This lifting capacity shall be clearly and permanently marked on each machine.
- (vii) Only operate attachments while stationary, as operation during travelling may starve one of the track drive motors and result in an unintended turn.
- (viii) Consider implementing a 'Permit to Work' system, particularly when working near power lines or underground power for example: - that the height of power lines is known; - that the underground location is known; and - visible measure, such as tiger tails, are put in place.

## 23.8 Requirements related to use of Trucks

### 23.8.1 General

- (i) Drive defensively
- (ii) Obey road signs
- (iii) Never race with other vehicles
- (iv) When following another vehicle, always allow enough distance to stop safely.
- (v) One truck length for every 10 km per hour of truck speed should be the minimum distance between vehicles.
- (vi) Reversing is the most hazardous truck operation. Reversing alarms, which are fitted on some trucks, are effective in warning persons of the danger. Reverse trucks only when they are under the direction of a signaller or when satisfied that the way is clear and will remain clear.
- (vii) Be cautious of spillage from loaded units and any hazards the spillage might present to people on the ground and to the tyres of other plant.
- (viii) Trucks sometimes fall over a tip head because the driver backs over the edge or the edge collapses under the weight of the truck.
- (ix) Use a protective beam or timber baulk or back under the control of a signaller in order to avoid this happening.
- (x) Principal Contractors should provide an earth mound to at least half the wheel diameter. This is a known control that is also used in the mining industry.
- (xi) Where ground conditions are soft, or the tip head is likely to subside, dump loads back from the edge and have a dozer move the material over the edge.

### 23.8.2 Loading

- (i) Never enter or leave the cab during loading.
- (ii) Watch for and avoid other vehicles, personnel, and rock outcrops on entering or leaving the loading area.
- (iii) Stay a safe distance from trucks ahead at the loading point, and follow the directions of the signaller or loader operator before moving into the loading position.
- (iv) Move off when signalled that loading is complete.
- (v) Load material, e.g., timber, so that it does not project beyond the truck body and present a hazard to other plant, people, or structures.
- (vi) Where material is to be transported on a public road, maintain a distance of 1.2 metre or more beyond the front or rear of the vehicle, or 150 mm on either side, shall have a visible red flag or object fastened to the projecting end.
- (vii) Unusually wide or long loads require a permit from the Police Department.
- (viii) Secure loads at the lowest possible level on the tray with ropes or chains, and take special care when the truck is to travel over rough terrain.
- (ix) Truck operators are responsible for giving load placement requirements to crane operators before loading operations begin.
- (x) The load should be placed so that it will remain stable during loading, unloading and travelling.

### 23.8.3 Unloading

- (i) Lower truck bodies before leaving the dump area.
- (ii) Only raise truck bodies to unload materials on surfaces where the vehicle will remain stable and upright.
- (iii) Never raise truck bodies to within a specified distance of overhead power line.
- (iv) Take special care when tipping a load or spreading screenings on a road.
- (v) With the tray up, trucks are less stable and are more likely to roll over, particularly on hilly sections or roads with surface irregularities or steep shoulders.
- (vi) Check that the raised tray will not foul overhead power lines or telephone wires.
- (vii) Never place part of your body under a raised truck body unless the truck body is securely propped.

### 23.8.4 Transporting personnel

- (i) Trucks shall not be used to transport personnel unless they are specifically designed to do so.
- (ii) Where a bus is employed for the transportation of personnel, the bus shall: -be enclosed; have seats which are attached to the vehicle; have a safe means of access and exit; and, have two means of exit in case of emergency.
- (iii) Drivers transporting personnel should be alert, dependable and careful.
- (iv) Relevant safety rules include: never allow passengers to ride with their arms outside the vehicle; only start the vehicle after everyone is seated; persons should only get on or off the vehicle when it is stationary; tools, plant or gear should be stored in a compartment separate from passengers, i.e., compartments that are designed for storage and transportation and are separate from where personnel are seated.
- (v) All items stored in this compartment should be secured against movement; and ensure that exhaust fumes do not enter the passengers' compartment.

### 23.8.5 Towing

- (i) When towing another vehicle, take the following precautions: ensure the towing cable is undamaged and has a safe working load adequate for the job.
- (ii) Slings, straps, or chains which are used for towing should not be used for lifting any gear or materials and should be identified as such, e.g., slings and chains, etc. should be tagged "not for use in hoisting operations";
- (iii) Before reversing, ensure everyone is clear. Get help from a signaller if the rear view is obstructed;
- (iv) Attach the towing cable securely to the machines at the points recommended by the manufacturer.
- (v) If these are not known, ensure fixing points are selected that will not damage the tow cable or the machine;
- (vi) check what brakes are operational on the towed vehicle. There is unlikely to be any power assistance available for the brake system. Do not rely on parking brakes as a means of control;
- (vii) When moving off, take up the slack carefully. Do not jerk the cable, and keep it taut to avoid damage;
- (viii) keep towing speed down and as constant as possible;
- (ix) Keep clear of the area between the towing vehicle and the towed vehicle; and attach a warning sign on the rear of the towed vehicle or machine which reads "Vehicle Under Tow".
- (x) Working of heavy mobile equipments in marshy soil, must ensure to keep two nos. of 25 mm thick MS Plates at the base (track chain) of the respective machine to avoid collapse of the same with sand bags at the ground.

### 23.9 Penalty

If any of the above clauses are not adhered, penalty shall be imposed as per relevant clause depending upon the gravity of the unsafe act and or condition.

**24.0 MACHINE AND GENERAL AREA GUARDING**

- 24.1 The Contractor shall ensure at the construction site all motors, cogwheels, chains and friction gearing, flywheels, shafting, dangerous and moving parts of machinery are securely fenced or legged. The fencing of dangerous part of machinery is not removed while such machinery is in motion or in use.

**25.0 MANUAL LIFTING AND CARRYING OF EXCESSIVE WEIGHT**

- 25.1 The Contractor shall ensure at his construction site of a building or other construction work that no building worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool, or appliances exceeding in weight as said below as per Rule 38 of BOCWR, unless aided by another building worker or device.

Person	Maximum weight in kg
Adult man	55
Adult woman	30

- 25.2 No building worker aided by other building worker shall lift or carry weight higher than or exceeding the sum of total of maximum limits set out for each building worker separately as mentioned in the table above.

**26.0 SITE ELECTRICITY**

- 26.1 Competency of Electrical personnel
- 26.1.1 The Contractor shall employ qualified and competent electrical personnel as specified in General Instruction Maha-Metro/SHE/GI/001.
- 26.2 Assessment of power
- 26.2.1 The Contractor shall assess the size and location of the electrical loads and the manner in which they vary with time during the currency of the Contract.
- 26.2.2 The Contractor shall elaborate as to how the total supply is to be obtained / generated. The details of the source of electricity, earthing requirement, substation / panel boards, distribution system shall be prepared and necessary approval from Employer obtained before proceeding of the execution of the job.
- 26.2.3 The main Contractor shall take consideration, the requirements of the sub / petty contractors' electric power supply and arrive at the capacity of main source of power supply from diesel generators.
- 26.2.4 As the sub / petty contractors' small capacity generators create more noise and safety hazard, no small capacity diesel generators shall be allowed for whatsoever the type of job to be executed under this contract.
- 26.2.5 If any unsafe noise making small capacity diesel generators are found used by sub / petty contractors the main contractor shall only be penalised.
- 26.3 Work on site
- The Contractor shall also submit electrical single line diagram, schematic diagram and the details of the equipment for all temporary electrical installation and these diagrams together with the temporary electrical equipment shall be submitted to the Employer's for necessary approval. Failure to do so shall invite penalty as per relevant clause.
- 26.4 Strength and capability of electrical equipment

No electrical equipment shall be put into use where its strength and capability may be exceeded in such a way as may give rise to danger.

#### 26.5 Adverse or hazardous environments

Electrical equipment, which may reasonably foreseeably be exposed to:

- a) Mechanical damage;
- b) the effects of the weather, natural hazards, temperature, or pressure;
- c) the effects of wet, dirty, dusty, or corrosive conditions; or
- d) any flammable or explosive substance, including dusts, vapours, or gases,

shall be of such construction or as necessary protected as to prevent, so far as is reasonably practicable, danger arising from such exposure.

#### 26.6 Distribution system

26.6.1 The Contractor shall provide distribution system for control and distribution of electricity from a main AC supply of 50Hz for typical appliances:

- a) Fixed plant – 400V 3 phase
- b) Movable plant fed via trailing cable over 3.75 kW – 400V, 3 phase
- c) Installation in site buildings – 230V single phase
- d) Fixed flood lighting – 230V single phase
- e) Portable and hand tools – 115V single phase
- f) Site lighting - 115V single phase
- g) Portable hand lamps – 115V single phase

#### 26.7 Electrical protection circuits

26.7.1 Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged. A conductor shall be regarded as earthed when conductors of sufficient strength and current-carrying capability to discharge electrical energy to earth connect it to the general mass of earth.

If a circuit conductor is connected to earth or to any other reference point, nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.

26.7.2 Appropriate electrical protection shall be provided for all circuits, against over load, short circuit, and earth fault current.

26.7.3 The Contractor shall provide sufficient ELCBs (maintain sensitivity 30 mA) / RCCBs for all the equipments (including Potable equipments), electrical switchboards, distribution panels etc. to prevent electrical shocks to the workers.

26.7.4 All protection devices shall be capable of interrupting the circuit without damage to any equipments and circuits in case of any fault may occur.

26.7.5 Rating of fuses and circuit breakers used for the protection of circuits should be coordinate with equipment power ratings.

26.7.6 Protection against lightning shall be ensured to all equipment kept in open at sites.

#### 26.8 Cables

- 26.8.1 Cables shall be selected after full consideration of the condition to which they shall be exposed and the duties for which they are required. Supply cable up to 3.3 kV shall be in accordance with BS 6346.
- 26.8.2 For supplies to mobile or transportable equipment where operating of the equipment subjects the cable to flexing, the cable shall conform to any of these codes BS 6007 / BS 6500 / BS 7375.
- 26.8.3 Flexible cords with a conductor cross sectional area smaller than 1.5 mm<sup>2</sup> shall not be used and insulated flexible cable shall conform to BS 6500 and BS 7375.
- 26.8.4 Where low voltage cables are to be used, reference shall be made to BS 7375. The following standards shall also be referred to particularly for underground cables BS 6346 and BS 6708
- 26.8.5 Cables buried directly in the ground shall be of a type incorporating armour or metal sheath or both. Such cables shall be marked by cable covers or a suitable marking tape and be buried at a sufficient depth to avoid their being damaged by any disturbance of the ground. Cable routes shall be marked on the plans kept in the site electrical register.
- 26.8.6 Cabling passing under the walk way and across way for transport and mobile equipment shall be laid in ducts at a minimum depth of 0.6 meters.
- 26.8.7 Cables that need to cross open areas, or where span of 3m or more are involved, a catenary wire on poles or other supports shall be provided for convenient means of suspension. Minimum height shall be 6m above ground.
- 26.8.8 Cables carrying a voltage to earth in excess of 65V other than supply for welding process shall have metal armour or sheath, which has been effectively earthed and monitored by the contractor. In case of flexible and trailing cables such earthed metal sheath and/or armour should be in addition to the earth core in the cable and shall not be used as the protective conductor.
- 26.8.9 Armoured cables having an over-sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring
- 26.9 Plugs, socket-outlets, and couplers
- 26.9.1 The Contractor shall ensure plugs, socket-outlets, and couplers available in the construction site as "splash proof" type. The minimum degree of Ingress Protection should be of IP44 in accordance with BS EN 60529.
- 26.9.2 Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the Internationally recognised standards for example as detailed as follows:
- i) 110 volts: Yellow
  - ii) 240 volts: Blue
  - iii) 415 volts: Red
- 26.10 Connections
- 26.10.1 Every joint and connection in a system shall be mechanically and electrically suitable for use to prevent danger. Proper cable connectors as per national/international standards shall only be used to connect cables.
- 26.10.2 No loose connections or tapped joints shall be allowed anywhere in the work site, office area, stores, and other areas. Penalty as per relevant clause shall be put in case of observation of any tapped joints.
- 26.11 Portable and hand-held equipments



The Contractor shall ensure the use of double insulated or all-insulated portable electrical hand equipment may be used without earthing (i.e., two core cables), but they shall still be used only on 110V because of the risk of damage to trailing leads.

#### 26.12 Other equipments:

26.12.1 All equipment shall have the provision for major switch/cut-off switch in the equipment itself.

26.12.2 All non-current carrying metal parts of electrical equipment shall be earthed through insulated cable

26.12.3 Isolate exposed high-voltage (over 415 Volts) equipment, such as transformer banks, open switches, and similar equipment with exposed energized parts and prevent unauthorised access.

26.12.4 Approved perimeter markings shall be used to isolate restricted areas from designated work areas and entryways and shall be erected before work begins and maintained for entire duration of work. Approved perimeter marking shall be installed with either red barrier tape printed with the words "DANGER—HIGH VOLTAGE" or a barrier of yellow or orange synthetic rope, approximately 1 to 1.5 meter above the floor or work surface.

#### 26.13 Work on or near live conductors

No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless:

- a) it is unreasonable in all the circumstances for it to be dead; and
- b) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and
- c) suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

#### 26.14 Inspection and Maintenance

26.14.1 All electrical equipment should be permanently numbered and a record kept of the date of issue, date of last inspection and recommended inspection period.

26.14.2 Fixed installations shall be inspected at least at three monthly intervals; routine maintenance being carried out in accordance with equipment manufactures recommendations.

### 27.0 LIGHTING

27.1 The Contractor shall provide sufficient site lighting, of the right type and at the right place for it to be properly effective. Lighting ought not to introduce the risk of electric shock. Therefore, 230V supplies should be used for those fittings, which are robustly installed, and well out of reach e.g., flood lighting or high-pressure discharge lamps.

#### 27.2 Selection of Luminaries

The Contractor shall select the luminaries as per the area requirement indicated below:

SN	Type of Lighting	Area of Requirement	Luminaries
1	Area Lighting	Workmen and vehicles to move about in safely.	Shovel type: non-symmetrical Symmetrical or non-symmetrical tungsten halogen
2	Beam flood lighting	Concentrated light over an area from a relatively great distance.	Portable flood light (Conical beam) Wide angle flood (fan shaped beam) Medium or narrow angle flood (Conical beam)

3	Dispersive lighting	Lighting for indoor	Dispersive (Mercury florescent) Cargo cluster Florescent trough
4	Walkway lighting	Lighting for stairways, ladder ways, corridors, scaffold access routes, etc.	Well glass unit Bulkhead unit (tungsten filament) Bulk head unit (Florescent)
5	Local lighting	Lighting on sites and fittings are generally accessible to operatives	PAR (Parabolic Aluminised Reflector) lamp cluster Festoons (with or without shades) Adjustable florescent work lamp Portable flood lamp (mounted on own cable drum)

- 27.3 The Contractor shall ensure that luminaries should always be placed so that no person is required to work in their own shadow and so that the local light for one person is not a source of glare for the others. Strongly made clamps should be available for attaching luminaries to poles and other convenient supports.
- 27.4 Luminaries should be robust, resistant to corrosion and rain proof especially at the point of the cable entry.
- 27.5 The correct type of lamp for each luminary should always be used and when lamps need to be replaced it shall be in accordance with the supply voltage.
- 27.6 Lamp holders not fitted with a lamp should be capped off.
- 27.7 The Contractor shall take every effort to illuminate the work site as per the Employer's requirement illustrated in General Instruction Maha-Metro/SHE/GI/011.

## 28.0 HAND TOOLS AND POWER TOOLS

### 28.1 General

- 28.1.1 The Contractor is wholly responsible for the safe condition of tools and equipment used by his employees and that of his sub-contractors.
- 28.1.2 Use of short / damaged hand tools shall be avoided and the Contractor shall ensure all his hand tools used at his worksite are safe to work with or stored and shall also train his employees (including his sub-contractors) for proper use thereby.
- 28.1.3 All hand tools and power tools shall be duly inspected before use for safe operation.
- 28.1.4 All hand tools and power tools shall have sufficient grip and the design specification on par with national/international standards on anthropometrics.

### 28.2 Hand tools

- 28.2.1 Hand tools shall include saws, chisels, axes and hatches, hammers, hand planes, screw drivers, crow bars, nail pullers.
- 28.2.2 The Contractor shall ensure that,
- For crosscutting of hardwood, saws with larger teeth points (no. of points per inch) shall be preferred to avoid the saw jumping out of the job.
  - Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.
  - Unless hatchet has a striking face, it shall be used as a hammer.
  - Only knives of retractable blades shall be used in the worksite.
  - No screwdrivers shall be used for scraping, chiselling, or punching holes.

- f) A pilot hole shall always be driven before driving a screw.
- g) Wherever necessary, usage of proper PPEs shall be used by his employees.

### 28.3 Power tools

28.3.1 Power tools include drills, planes, routers, saws, jackhammers, grinders, sprayers, chipping hammers, air nozzles and drills.

28.3.2 The Contractor shall ensure that:

- (i) Electric tools are properly grounded or / and double insulated.
- (ii) GFCIs/ RCCBs shall be used with all portable electric tool operated especially outdoors or in wet condition.
- (iii) Before making any adjustments or changing attachments, his workers shall disconnect the tool from the power source.
- (iv) When operating in confined spaces or for prolonged periods, hearing protection shall be required. The same shall also apply to working with equipments, which gives out more noise as mentioned in Clause 43.0 of this document.
- (v) Tool is held firmly and the material is properly secured before turning on the tool.
- (vi) All drills shall have suitable attachments respective of the operations and powerful for ease of operation.
- (vii) When any work / operation needs to be performed repeatedly or continuously, tools specifically designed for that work shall be used. The same is applicable to detachable tool bit also.
- (viii) Size of the drill shall be determined by the maximum opening of the chuck in case of drill bit.
- (ix) Attachments such as speed reducing screwdrivers and buffers shall be provided to prevent fatigue and undue muscle strain to his workers.
- (x) Stock should be clamped or otherwise secured firmly to prevent it from moving.
- (xi) Workers shall never stand on the top of the ladder to drill holes in walls / ceilings, which can be hazardous, instead standing on the fourth or fifth rung shall be recommended.
- (xii) Electric plane shall not be operated with loose clothing or long scarf or open jacket.
- (xiii) Safety guards used on right angle head or vertical portable grinders must cover a minimum of 180° of the wheels and the spindle / wheel specifications shall be checked.
- (xiv) All power tools / hand tools shall have guards at their nip points.
- (xv) Low profile safety chain shall be used in case of wood working machines and the saw shall run at high rpm when cutting and also correct chain tension shall be ensured to avoid "kickback".
- (xvi) Leather aprons and gloves shall be used as an additional personal protection auxiliary to withstand kickback.
- (xvii) Push sticks shall be provided and properly used to hold the job down on the table while the heels move the stock forward and thus preventing kickbacks.

- (xviii) Air pressure is set at a suitable level for air actuated tool or equipment being used. Before changing or adjusting pneumatic tools, air pressure shall be turned off.
- (xix) Only trained employees shall use explosive actuated tools and the tool shall also be unloaded when not in use.
- (xx) Usage of such explosive actuated tools shall be avoided in case of places where explosive/flammable vapours or gases may be present.
- (xxi) Explosive actuated tools and their explosives shall be stored separately and be taken out and loaded only before the time of immediate use.
- (xxii) Misfired cartridges of explosive actuated tools must be placed in a container of water and be removed safely from the project.
- (xxiii) No worker shall point any power operated / hand tool to any other person especially during loading / unloading.

## **29.0 WELDING, GOUGING AND CUTTING**

- 29.1 Gas cylinders in use shall be kept upright on a custom-built stand or trolley fitted with a bracket to accommodate the hoses and equipment or otherwise secured. The metal cap shall be kept in place to protect the valve when the cylinder is not connected for use.
- 29.2 Hose clamp or clip shall be used to connect hoses firmly in both sides of cylinders and torches.
- 29.3 All gas cylinders shall be fixed with pressure regulator and dial gauges
- 29.4 Non-return valve and Flashback arrester shall be fixed at both end of cylinder and torch.
- 29.5 Domestic LPG cylinders shall not be used for Gas welding and Cutting purpose.
- 29.6 DCP or CO2 type Fire Extinguisher not less than 5 kg shall be fixed at or near to welding process zone in an easily accessible location. Fire Extinguisher should confirm to IS 2190: 1992.
- 29.7 Use firewatchers if there is a possibility of ignition unobserved by the operator (e.g., on the other side of bulkheads).
- 29.8 Oxygen cylinders and flammable gas cylinders shall be stored separately, at least 6.6 meters (20 feet) apart or separated by a fire proof, 1.5 meters (5 feet) high partition. Flammable substances shall not be stored within 15 meters of cylinder storage areas.
- 29.9 Transformer used for electrical arc welding shall be fixed with Ammeter and Voltmeter and also fixed with separate main power switch.
- 29.10 Welding grounds and returns should be securely attached to the work by cable lugs, by clamps in the case of stranded conductors, or by bolts for strip conductors. The ground cable will not be attached to equipment or existing installations or apparatus.
- 29.11 Use a low voltage open circuit relay device if welding with alternating current in constricted or damp places.
- 29.12 Take precautions against the risk of increased fume hazards when welding with chrome containing fluxed consumables or high current metal inert gas (MIG) or tungsten inert gas (TIG) processes.
- 29.13 Avoid being in contact with water or wet floors when welding. Use duckboards or rubber protection.

- 29.14 All electrical installations shall meet the IS: 5571: 1997 and NFPA 70 for gas cylinder storage area and other hazardous areas.
- 29.15 The current for Electric arc welding shall not exceed 300 A on a hand welding operation.
- 29.16 Fire blankets are to be used at all the times while hot works are in progress in order to arrest the free fall of welding spatters

### **30.0 DANGEROUS AND HARMFUL ENVIRONMENT**

30.1 A confined space is any space that:

- i) Is large enough and so configured that a worker can bodily enter (any portion of the body) and perform assigned work,
- ii) Has limited or restricted mean for entry and/or exit,
- iii) Is not designed for continuous occupancy
- iv) Contains or has the potential to contain a hazardous atmosphere,
- v) Contains a material that has the potential for engulfing an entrant,
- vi) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section, or
- vii) Contains other recognized serious safety or health hazard.

30.2 Contractors must ensure all confined spaces are identified and managed using documented site confined space management methods.

30.3 As per BOCWR Rule 40:

- (i) When internal combustion engines are to be used into a confined space or excavation or tunnel or any other workplace where neither natural or artificial ventilation system is inadequate to keep carbon monoxide below 50ppm, exposure of building workers shall be avoided unless suitable measures are taken and provided by the Contractor.
- (ii) No worker shall be allowed into any confined space or tank or trench or excavation wherein there is given off any dust, fumes / vapours or other impurities which is likely to be injurious or offensive, explosive, or poisonous or noxious or gaseous material or other harmful articles unless steps are carried out by the Contractor and certified by the responsible person to be safe.

30.4 Dangerous Substances: -

- 30.4.1 A substance is considered dangerous if one or several of its properties render it dangerous. The Contractor identifies and manages dangerous substances planned for use on the Worksite in the manner described in the present Clause.
- 30.4.2 The transport to the Worksite and use of dangerous substances requires prior authorisation from the Engineer.
- 30.4.3 Details of risks and related prevention and protection measures are included in the health and safety plan.
- 30.4.4 The Contractor obtains all necessary authorisations and/or licenses for the storage and use of dangerous substances from local authorities. A copy of the authorisations is provided to the Engineer.
- 30.4.5 For each dangerous substance used, the Contractor will implement the recommendations described (i) in the Material Safety Data Sheets (MSDS), and (ii) by the Globally Harmonized System of Classification and Labelling of Chemicals established by the United Nations for hazardous chemicals.
- 30.4.6 Copies of MSDSs are kept on the Worksite and made available to personnel. The Contractor provides the Engineer with copies of all MSDSs.

#### 30.4.7 Storage of dangerous substances

Storage areas are designed and equipped by the Contractor based, not only on the chemical and physical properties of the products, but also on the types of containers stored, the number of people requiring access, and the quantities of the substance used.

Pursuant to SHE Clause 53.11, the Contractor anticipates and plans for the storage and management of hazardous waste.

Storage areas for dangerous substances are subject to strict rules, which are regularly checked by the SHE manager appointed. The rules include the following as a minimum:

- a) Access to the storage area is limited to trained and authorised individuals.
- b) An inventory is maintained up-to-date.
- c) MSDSs must be available for all stored dangerous substances, and the substances must be clearly labelled.
- d) A strict and methodical storage system is implemented (storage plan posted, large or heavy packaging may not be stored at heights, equipment and tools may not be stored in the dangerous substance storage room).
- e) Compliance with product expiry dates and implementation of a disposal procedure for substances which are not needed, or which have expired.
- f) Entrances, exits and access to emergency equipment are always kept clear.

Storage areas are clearly identified with warning signs at the entrance. The Contractor displays the storage plan (location of the different products, maximum inventory), a summary of labelling system and information on chemical incompatibilities.

Chemicals which could react together (leading to explosions, fire, projections, or the emission of dangerous gases) are physically separated.

Products that react violently with water are stored so as to prevent contact with water, even in the event of flooding.

Inflammable products are always stored separately in a dedicated area with adequate ventilation.

Buildings used to store large quantities of dangerous substances are isolated from other buildings to avoid the spreading of fire. Such buildings are constructed using solid and non-combustible building materials and are equipped with evacuation systems and the appropriate firefighting equipment. Access to the buildings is clear, allowing for rapid evacuation in the event of an accident. The electrical systems are reduced to the essential minimum, and access points are equipped with adequate lighting (300 lux).

All storage areas are equipped with secondary retentions. Each storage area acts as a general secondary retention. Suitable absorbents (neutralising and non-combustible) are available in the storage area to clean up any spills and leaks.

The Contractor maintains the storage area at a suitable temperature for dangerous substances to prevent overpressure and bursting of containers.

### 31.0 FIRE PREVENTION, PROTECTION AND FIGHTING SYSTEM

- 31.1 The Contractor shall ensure that construction site is provided with fire extinguishing equipment sufficient to extinguish any probable fire at construction site. An adequate water supply is provided at ample pressure as per national standard.
- 31.2 Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards.
- 31.3 All drivers of vehicles, foreman, supervisors, and managers shall be trained on operating the fire extinguishers and fire fighting equipment.

- 31.4 The Contractor shall also consider the provision of adequate fire fighting arrangements within the underground and tunnelling operations including the provision of Fire Service compatible hose connections and emergency lighting.
- 31.5 As per the GBOCW Rules 2003, all lifting appliances' driver cabin should be provided with a suitable portable fire extinguisher.
- 31.6 Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.
- 31.7 Every fire, including those extinguished by Contractor personnel, shall be reported to the Employer representatives.
- 31.8 Emergency plans and Fire Evacuation plans shall be prepared and issued. Mock drills should be held on a regular basis to ensure the effectiveness of the arrangements and as a part of the programme, the Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.

### **32.0 CORROSIVE SUBSTANCES**

As per BOCWR Rule 44, corrosive substances including alkalis and acids shall be stored and used by a person dealing with such substances at a building / construction site in a manner that it does not endanger the building worker and suitable PPE shall be provided by the Contractor to the worker during such handling and work. In case of spillage of such substances on building worker, the Contractor shall take immediate remedial measures.

### **33.0 DEMOLITION**

- 33.1 The Contractor shall ensure that:
- (i) all demolition works be carried out in a controlled manner under the management of experienced and competent supervision.
  - (ii) the concerned department of the Government or local authority be informed, and permission obtained wherever required. Media shall also be informed regarding this concern.
  - (iii) all glass or similar materials or articles in exterior openings are removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines are put-off and such lines so located or capped with substantial coverings so as to protect it from damage and to afford safety to the building workers and public.
  - (iv) examine the walls of all structures adjacent to the structure to be demolished to determine thickness, method of support to such adjacent structures
  - (v) no demolishing work be performed if the adjacent structure seems to be unsafe unless and until remedial measures like sheet piling, shoring, bracing, or similar means be ensured for safety and stability for adjacent structure from collapsing.
  - (vi) debris / bricks and other materials or articles shall be removed by means of:
    - (a) chutes
    - (b) buckets or hoists
    - (c) through openings through floors or
    - (d) any other safe means
  - (vii) no person other than building workers or other persons essential to the operation of demolition work shall be permitted to enter a zone of demolition and the area be provided with substantial barricades.

**33.2 Damages to people and property.**

- 33.2.1 Pursuant to Clauses 4.14 and 17.1 of the GCC, the Contractor is responsible for damages to people and property caused by the execution of the works or the procedures used for execution.
- 33.2.2 The Engineer is informed of any damage caused to people, or the property of individuals, other than the Contractor's personnel, within 6 hours of the event, regardless of the value of the prejudice.
- 33.2.3 Housing existing before the start of the works, located within a minimum radius of 800 m around the perimeter of the quarries and within a minimum radius of 500 m around the other Worksites that will be subject to blasting, will be examined by a bailiff unless agreed upon otherwise with the Engineer.
- 33.2.4 The bailiff's sworn statement is prepared and provided to the Engineer with the SEPP.
- 33.2.5 Should any problems be detected due to the intensity of blasting, the Engineer is entitled to request that the Contractor carry out seismic measurements of the intensity of the vibrations induced by the blasting, at variable distances from the blasting points, under the supervision of the Engineer, and at the cost of the Contractor.

**34.0 EXCAVATION****34.1 Excavation: The Contractor shall ensure:**

- (i) where any construction building worker engaged in excavation is exposed to hazard of falling or sliding material or article from any bank or side of such excavation which is more than one 1.5 m above his footing, such worker is protected by adequate piling and bracing against such bank or side.
- (ii) where banks of an excavation are undercut, adequate shoring is provided to support the material or article overhanging such bank.
- (iii) excavated material is not stored at least 0.65 m from the edge of an open excavation or trench and banks of such excavation or trench are stripped of loose rocks and the banks of such excavation or trench are stripped of loose rocks and other materials which may slide, roll or fall upon a construction building worker working below such bank.
- (iv) metal ladders and staircases or ramps are provided, as the case may be, for safe access to and egress from excavation where, the depth of such excavation exceeds 1.5 m and such ladders, staircases or ramps comply with the IS 3696 Part 1&2 and other relevant national standards.
- (v) trench and excavation are protected against falling of a person by suitable measures if the depth of such trench or excavation exceeds 1.5 m and such protection is an improved protection in accordance with the design and drawing of a professional engineer, where such depth exceeds 4m.

**34.2 Tunnelling**

- 34.2.1 The Contractor shall inform in writing to the Director General within 30 days, prior to the commencement of any tunnelling work.
- 34.2.2 The Contractor shall appoint a responsible person for safe operation for tunnelling work as per Rule 121 & 125 of BOCWR.
- 34.2.3 The contractor shall ensure:



- (i) every compressed air system in a tunnel is provided with emergency power supply for maintaining continued supply of compressed air as per Rule 155 of BOCWR
- (ii) watertight bulkhead doors are installed at the entrance of a tunnel to prevent flooding.
- (iii) reliable and effective means of communication such as telephone or walkie-talkie are provided and maintained for arranging better effective communication at an excavation or tunnelling work as per Rule 136 of BOCWR.
- (iv) all portable electrical hand tools and inspection lamp used in underground and confined space at an excavation or tunnelling work is operated at a voltage not exceeding 24V.
- (v) only flame proof equipment of appropriate type as per IS: 5571:2000 and or other relevant national standard is used inside the tunnel
- (vi) petrol or LPG or any other flammable substances are not used, stored inside the tunnel except with prior approval from Employer, and also no oxy-acetylene gas is used in a compressed air environment in excavation or tunnelling.
- (vii) adequate number of water outlets provided for fire fighting purpose, an audible fire alarm and adequate number and types of fire extinguishers are provided and maintained.
- (viii) temperature in any working chamber in an excavation or tunnelling work where workers employed does not exceed 29°C as per Rule 165 of BOCWR.
- (ix) all working areas in a free air tunnel are provided with ventilation system as approved by the Director General and the fresh air supplied in such tunnel is not less than 6 m<sup>3</sup>/ min for each worker employed in tunnel as per Rule 153 of BOCWR.

### 34.3 Piling

#### 34.3.1 General Precautions

There are certain hazards which are common to all types of piling, and the following precautions are necessary:

- i) prior to piling, all underground services should be located and made safe. A check should be made to ensure there are no cellars, underground water courses or ground conditions which might cause hazards; there should be a firm level base for the crane, or crane mats provided;
- ii) when working on piling operations one must wear a safety helmet, and ear and eye protection where necessary;
- iii) All cranes, lifting appliances and lifting gear must have appropriate certificates of testing and thorough examination, and should be large enough for the job;
- iv) particular attention should be paid to the risk of damage to lifting gear from sharp edges;
- v) Cranes used for raising or lowering workers must be fitted with a dead man's handle and lowering should be done under power; you must be carried in properly constructed cages which cannot spin or tip;
- vi) piling contractors should be asked to provide a written method statement setting out the precautions relevant to the type of piling they are to employ;
- vii) Induction training and information for you as supervisor or operative should be specifically related to the method statement.

#### 34.3.2 Bored Piles

Workers may need to enter a borehole for inspection or for clearing out in undercuts, and there are certain precautions which must be taken prior to entry:

- (i) the borehole should be at least 75 cm in diameter;

- (ii) the borehole should be treated as a confined space and the precautions which are advised elsewhere to ensure a satisfactory atmosphere must be closely followed;
- (iii) waste material from the borehole should be kept clear of the borehole;
- (iv) Descent into a borehole should be in properly designed skips, chains or cages fitted with an anti-spin device. The power source of the lifting appliance should be kept running throughout the time someone is underground;
- (v) while a worker is working down a borehole, he/she must wear a safety harness;
- (vi) all workers concerned must be trained and competent in rescue from deep boreholes, and emergency rescue drills should be carried out at regular intervals;
- (vii) A banksman who can see workers in the borehole should be present at all times;
- (viii) There must be adequate lighting at safe reduced voltage and a means of communication from the borehole.
- (ix) Wherever possible, the need for workers to enter pile boreholes should be avoided by the use of television cameras and other techniques for remote inspection.

#### 34.4 Warning signs and notices

The Contractor shall ensure that:

- (i) suitable warning signs or notices, required for the safety of building workers carrying out the work of an excavation or tunnelling, shall be displayed or erected at conspicuous places in Hindi and in a language understood by majority of such building workers at such building such excavation or tunnelling work
- (ii) such warning signs and notices with regard to compressed air working shall include
  - (a) the danger involved in such compressed air work
  - (b) fire and explosion hazard
  - (c) the emergency procedures for rescue from such danger or hazards.

### 35.0 WORK PERMIT SYSTEM

35.1 The Contractor shall develop a Work Permit system, which is a formal written system used to control certain types of work that are potentially hazardous. A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work Permits form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

35.2 A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high-risk activities include but are not limited to:

- (i) Entry into confined spaces
- (ii) Work in close proximity to overhead power lines and telecommunication cables.
- (iii) Hot work
- (iv) To dig where underground services may be located
- (v) Work with heavy moving machinery
- (vi) Working on electrical equipment
- (vii) Work with radioactive isotopes
- (viii) Heavy lifting operations and lifting operations closer to live power line

35.3 The permit-to-work system should be fully documented, laying down:

- (i) How the system works;
- (ii) The jobs it is to be used for;
- (iii) The responsibilities and training of those involved; and
- (iv) How to check its operation;

- 35.4 A Work Permit authorisation form shall be completed with the maximum duration period not exceeding 12 hours.
- 35.5 A copy of each Permit-to-Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.

### 36.0 TRAFFIC MANAGEMENT

- 36.1 The basic objective of the following guidelines is to lay down procedures to be adopted by Contractor to ensure the safe and efficient movement of traffic and also to ensure the safety of workmen at construction sites.
- 36.2 All construction workers should be provided with high visibility jackets with reflective tapes as most of viaduct /tunnelling and station works or either above or under right-of-way. The conspicuity of workmen at all times shall be increased so as to protect from speeding vehicular traffic.
- 36.3 The guiding principles to be adopted for safety in construction zone are to:
- (i) Warn the road user clearly and sufficiently in advance.
  - (ii) Provide safe and clearly marked lanes for guiding road users.
  - (iii) Provide safe and clearly marked buffer and work zones
  - (iv) Provide adequate measures that control driver behaviour through construction zones.
- 36.4 Legal permission
- 36.4.1 In all cases, the Contractor shall employ proper precautions. Wherever operations undertaken are likely to interfere with public traffic, specific traffic management plans shall be drawn up and implemented by the Contractor in consultation with the approval of local police authorities and/or the concerned metropolitan/civil authorities as the case may be.
- 36.4.2 Such traffic management plans shall include provision for traffic diversion and selection of alternative routes for transport of equipment. If necessary, the Contractor shall carry out road widening before commencement of works to accommodate the extra load.
- 36.5 The primary traffic control devices used in work zones shall include signs, delineators, barricades, cones, pylons, pavement markings and flashing lights.
- 36.6 The road construction and maintenance signs which fall into the same three major categories as do other traffic signs, that are Regulatory Signs, Warning Signs and Direction (or guidelines) Signs shall only be used. The IRC: 67 (Code of Practice for Road Signs) provide a list of traffic signs. The size, colours and placement of sign shall confirm to IRC: 67.
- 36.7 Regulatory signs
- Regulatory signs impose legal restriction on all traffic. It is essential, therefore, that they are used only after consulting the local police and traffic authorities.
- 36.8 Warning signs
- 36.8.1 Warning signs in the traffic control zone shall be utilised to warn the drivers of specific hazards that may be encountered.
- 36.8.2 The Contractor shall place detour signage at strategic locations and install appropriate warning signs. In order to minimize disruption of access to residences and business, the Contractor shall maintain at least one entrance to a property where multiple entrances exist.
- 36.8.3 A warning sign as given in General Instruction Maha-Metro/SHE/GI/012 shall be installed at all secondary road which merges with the primary road where the construction work is in progress

at sufficient distance before it merges with the primary road so as to alert the road users regarding the 'Metro Work in Progress'.

- 36.8.4 Materials hanging over / protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.

### 36.9 Delineators

The delineators are the elements of a total system of traffic control and have two distinct purposes:

- (i) To delineate and guide the driver to and along a safe path
- (ii) As a taper to move traffic from one lane to another.

- 36.9.1 These channelizing devices such as cones, traffic cylinders, tapes and drums shall be placed in or adjacent to the roadway to control the flow of traffic. These should normally be retro-reflectors complying with IRC: 79 - Recommended Practice for Road Delineators.

#### 36.9.2 Traffic cones and cylinders

Traffic cones of 500mm, 750mm and 1000mm high and 300mm to 500mm in diameter or in square shape at base and are often made of plastic or rubber and normally have retro-reflectorised red and white band shall be used wherever required.

#### 36.9.3 Drums

Drums about 800mm to 1000mm high and 300mm in diameter can be used either as channelizing or warning devices. These are highly visible, give the appearance of being formidable objects and therefore command the respect of drivers.

#### 36.9.4 Barricades

- (i) Full height fence, barriers, barricades etc. shall be erected around the site in order to prevent the working area from the risk of accidents due to speedy vehicular movement. Same the way barricades protect the road users from the danger due to construction equipment and other temporary structures.
- (ii) The structure dimension of the barricade, material and composition, its colour scheme, Maha-Metro logo and other details shall be in accordance with specifications laid down in tender document.
- (iii) All barricades shall be erected as per the design requirements of the Employer, numbered, painted and maintained in good condition and also Barricade in-charge maintains a barricade register in site.
- (iv) All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricade. Conspicuity shall be ensured by affixing retro reflective stripes of required size and shape at appropriate angle at the bottom and middle portion of the barricade at a minimum gap of 1000mm. In addition, minimum one red light or red light blinker should be placed at the top of each barricade.

- 36.9.5 The Contractor shall ensure that all his construction vehicles plying on public roads (like dump trucks, trailers, etc.) have proper license to ply on public roads from the State Transport Authority. Drivers holding proper valid license as per the requirements of Motor Vehicles Act shall drive these vehicles.

- 36.9.6 The Contractor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads by the contractor applying the excuse of work execution.

### 36.9.7 Tow away vehicle

The Contractor shall make arrangements by keeping tow away van / manpower to tow away any breakdown vehicle in the traffic flow without losing any time at his cost.

### 36.9.8 Cleaning of roads

The Contractor shall ensure the cleanliness of roads and footpaths by deploying proper manpower for the same. The Contractor shall have to ensure proper brooming, cleaning washing of roads and footpaths on all the time throughout the entire stretch till the currency of the contract including disposal of sweepage.

36.9.9 The Contractor defines the characteristics of its fleet of vehicles and site machinery in the WESMP.

36.9.9.1 The Contractor defines the itineraries used on a map for each route between the different Worksites and obtains the validation of the Engineer. The Contractor requests that the Employer obtain the authorisations of the competent administrative authorities if public roads are used.

36.9.9.2 Within one month of the start of works, the Contractor informs the administrative authorities of areas crossed by the Contractor's vehicles, of the itinerary and characteristics (frequency of passing, size and weight of trucks, materials carried) of the Contractor's fleet of vehicles.

36.9.9.3 If public roads are used, and unless approved otherwise by the Engineer, the Contractor mandates a bailiff to make a sworn report regarding the state of the road prior to use by the Contractor's vehicles. The report is annexed to the W-ESMP.

36.9.9.4 The Contractor describes in the W-ESMP expected traffic created by its fleet of vehicles (frequency of trips between Worksites, working hours, convoys).

36.9.9.5 Unless specified otherwise in the Contract or instructed otherwise by the Engineer, heavy vehicles (i.e. with a GVWR of more than 3.5 tons) may not be used at night between 22:00 and 06:00.

### **36.9.9.6 Speed limits**

36.9.9.6.1 The Contractor takes action to limit and check the speed of all vehicles and machinery used to execute the works.

36.9.9.6.2 The maximum speed of all machinery and vehicles of the Contractor comply with the lowest of the following: the speed limit defined according to the Employer's country regulations or the following limits.

- a) 10 km/h within the Worksites.
- b) 30 km/h in villages or hamlets, from 100m before the first house.
- c) 50 km/h in towns.
- d) 80 km/h on unpaved roads outside of towns, villages, hamlets and camps.

36.9.9.6.3 Pursuant to Clause 4.15 of the GCC, and in coordination with the competent Employer's country authorities, the Contractor provides and installs signs for the fleet of vehicles along public roads, when public signs are inadequate.

36.9.9.6.4 The Contractor provides each of its drivers with a map at the appropriate scale of the roads authorised for the execution of the works, clearly indicating the maximum speeds authorised, and ensures their understanding.

- 36.9.9.6.5 The Contractor implements a real-time GPS location solution for each of its vehicles and permanently remote monitor of the position and speed of each vehicle.

### **37.0 WORK ADJACENT TO LIVE RAILWAYS**

- 37.1 Whenever work is to be conducted in close proximity to the live railways then the following measures shall need to be addressed:
- (i) The rules provided for in the Railway's manual should be followed.
  - (ii) No persons are allowed to encroach onto the railway unless the owner has given specific authority.
  - (iii) Adequate protection in accordance with the railway owner's requirements shall be followed. (Provision of Block Inspectors, Flagmen and Lookouts)
  - (iv) All persons shall wear high visibility clothing at all times.
  - (v) Any induction training requirements of the railways shall be strictly observed

### **38.0 BATCHING PLANT AND CASTING YARD LAYOUT**

- 38.1 The batching plant / casting yard shall be effectively planned for smooth flow of unloading and stacking the aggregates reinforcements and cement, batching plant, transport of concrete, casting the segment, stacking the segment and loading the segments to the trucks. As far as possible the conflicts should be avoided.
- 38.2 Required permission (CTE and CTO) from Maharashtra Pollution Control Board shall be obtained prior to establishing and commissioning of the batching plant and conditions of the CTE and CTO shall be complied.
- 38.3 The batching plant area shall be barricaded for wind breaking and shall be made as a compulsory PPE zone
- 38.4 If in case of material unloading area is not maintainable as PPE zone, the same shall be segregated properly and made as a non-PPE zone with appropriate barrications.
- 38.5 Electrical system shall also be suitably planned so that location of diesel generator, if any, location of DBs, routing of cables and positioning of area lighting poles/masts does not infringe on any other utility and pose danger.
- 38.6 Drainage shall be effectively provided and waste water shall be disposed after proper treatment
- 38.7 Time office, canteen, drinking water, toilet and rest place shall be suitably located for the easy access to workers. All the facilities shall be properly cleaned and maintained during the entire period of operation.
- 38.8 Manual handling of cement shall be avoided to a larger extent. Whenever it is absolutely necessary the workmen shall be given full body protection, hand protection and respiratory protection as a basic measure of ensuring better health.
- 38.9 The PPEs provided to cement handling workmen shall conform to international standards.
- 38.10 Access roads and internal circulation roads shall be well laid and maintained properly at all time.
- 38.11 Non-adherence to any of the above provision shall be penalised as per relevant penalty clause.
- 38.12 Approval of the batching plant to be taken from CPCB/MPCB/Local Municipal Corporation.

### **39.0 PERSONAL PROTECTIVE EQUIPMENTS (PPEs)**

- 39.1 The Contractor shall provide required PPEs to workmen to protect against safety and / or health hazards. Primarily PPEs are required for the following protection

- (i) Head Protection (Safety helmets)
- (ii) Foot Protection (Safety footwear, Gumboot, etc)
- (iii) Body Protection (High visibility clothing (waistcoat/jacket), Apron, etc)
- (iv) Personal fall protection (Full body harness, Rope-grap fall arrester, etc)
- (v) Eye Protection (Goggles, Welders glasses, etc)
- (vi) Hand Protection (Gloves, Finger coats, etc)
- (vii) Respiratory Protection. (Nose mask, SCBAs, etc.)
- (viii) Hearing Protection (Ear plugs, Ear muffs, etc)

- 39.2 The PPEs and safety appliances provided by the Contractor shall be of the standard as prescribed by Bureau of Indian Standards (BIS). If materials conforming to BIS standards are not available, the Contractor as approved by the Employer shall procure PPE and safety appliances.
- 39.3 All construction workers should be provided with high visibility jackets with reflective tapes confirming to the requirement specified under BS EN 471: 1994 as most of viaduct /tunnelling and station works are executed either above or under right-of-way. The conspicuity of workmen at all times shall be increased so as to protect them from speeding vehicular traffic.
- 39.4 The Contractor shall provide safety helmet, safety shoe and high visibility clothing for all employees including workmen, traffic marshal and other employees who are engaged for any work under this contract as per the following requirement.

All employees of the Contractor including workmen	Traffic marshals
Hard hat with company Logo	Hard hat with reflective tape
Safety boots	Safety boots
<p>Hi-visibility waistcoat covering upper body and meeting the following requirements as per BS EN 471:1994:</p> <p>Background in fluorescent orange-red in colour Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm<sup>2</sup> Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm<sup>2</sup> Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. The bottom strip shall be at a distance of 5cm from the bottom of the vest. Strips must be retro reflective and fluorescent Waistcoat shall have a side adjustable fit and a side and front tear-away feature on vests made of nylon.</p>	<p>Hi-visibility jacket covering upper body and meeting the following requirements as per BS EN 471:1994:</p> <p>Background in fluorescent orange-red in colour Jackets with full-length sleeves with two bands of retro reflective material, which shall be placed at the same height on the garment as those of the torso. The upper band shall encircle the upper part of the sleeves between the elbow and the shoulder; the bottom of the lower band shall not be less than 5cm from the bottom of the sleeve. Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm<sup>2</sup> Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm<sup>2</sup> Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. The bottom strip shall be at a distance of 5cm from the bottom of the vest. Strips must be retro reflective and fluorescent.</p>

#### 39.4.1 Colour coding for helmets

Safety Helmet Colour Code (Every Helmet should have the LOGO* affixed /painted)	Person to use
White	Maha-Metro staffs
Grey	All Designers, Architect, Consultants, etc.
Violet	Main Contractors (Engineers / Supervisors)

Blue	All Sub-contractors (Engineers / Supervisors)
Red	Electricians (Both Contractor and Sub-contractor)
Green	Safety Professionals (Both Contractor and Sub-contractor)
Orange	Security Guards / Traffic marshals
Yellow	All workmen/Drivers/Operators
White (with "VISITOR" sticker)	Visitors

**Note: LOGO\***

- (i) Logo shall have its outer dimension 2" \*2" and shall be conspicuous
- (ii) Logo shall be either painted or affixed
- (iii) No words shall come either on Top / Bottom of Logo

Logo of the corresponding main contracting company for their employees and sub-contracting company for their employees shall only be used.

- 39.5 In addition to the above any other PPE required for any specific jobs like, welding and cutting, working at height, tunnelling etc shall also be provided to all workmen and also ensure that all workmen use the PPEs properly while on the job.
- 39.6 The Contractor shall not pay any cash amount in lieu of PPE to the workers/sub-contractors and expect them to buy and use during work.
- 39.7 The Contractor shall at all time maintain a minimum of 10% spare PPEs and safety appliances and properly record and show to the Employer during the inspections. Failing to do so shall invite appropriate penalty as per the provisions of the contract.
- 39.8 It is always the duty of the Contractor to provide required PPEs for all visitors. Towards this required quantity of PPEs shall be kept always at the security post.
- 39.9 Warning to Safety offenders
- i) A warnings cards shall be issued by nominated person of Maha-Metro to Contractor staff or worker in case of serious violation.
  - ii) Yellow card shall be issued on first safety offence/violation. A sticker to be pasted on his helmet and his identity card shall be stamped for two weeks during which he will be under observation. The warning cards shall be withdrawn by the same nominated person after satisfactory completion of two weeks of period.
  - iii) Red card shall be issued in case of repeat safety violation carried out in two weeks by the same person or if he repeats safety violation more than three times in a year. Such Red card holders shall be withdrawn from site and attend a repeat Safety Training for min. three days before re-induction. The person shall be demobilised in case of second Red Card issue.

**40.0 VISITORS TO SITE**

- 40.1 No visitor is allowed to enter the site without the permission of the Employer. All authorised visitors should report at the site office. Contractor shall provide visitor's helmet (White helmet with visitor sticker) and other PPEs like Safety Shoe, reflective jacket, respiratory protection etc. as per requirement of the site.
- 40.2 All Visitors shall be accompanied at all times by a responsible member of the site personnel.
- 40.3 The Contractor shall be fully responsible for all visitors' safety and health within the site.

**40.4 Complaint Response Process**



- 40.4.1 Inquiries, complaints, and requests for information can be expected from a wide range of individuals and organizations both private and government. The majority of complaints are likely to be received by Maha-Metro, although the site offices are also likely to be contacted.
- 40.4.2 The objective of complaint process is to ensure that public and agency complaints are addressed and resolved consistently and expeditiously.
- 40.4.3 The Contractor's Site Manager will be notified immediately on receipt of complaint that may relate to environmental impacts. The Site Manager will immediately inform the Engineer and through him the Maha-Metro.
- 40.4.4 Field investigation should determine whether the complaint has merit, and if so, action should be taken to address the impact.
- 40.4.5 The outcome of the investigation and the action taken shall be documented on a complaint performa prepared by the Contractor and approved by the Engineer in advance of the works.
- 40.4.6 Where possible, a formal response to each complaint received shall be prepared by the Contractor within seven days in order to notify the concerned person(s) that action has been taken.

#### **40.5 Completion of the EQM Programme**

- 40.5.1 The construction of Project will be undertaken as a series of individual construction contracts with necessarily different construction program and completion dates.
- 40.5.2 The Engineer shall maintain an overview of the 'impact causing potential' of each site or contract and monitoring parameter with a view to maintaining the most cost-effective use of the environmental resources dedicated to the Project.
- 40.5.3 Termination of EQM should focus on the percentage contract completion status and on the basis of a history of environmental impact arising from the site over a representative period of monitoring.
- 40.5.4 Justifiable application for termination of EQM shall be put forward by the Contractor to the Engineer, as necessary throughout the construction period.

## **PART III: OCCUPATIONAL HEALTH AND WELFARE**

### **41.0 PHYSICAL FITNESS OF WORKMEN**

- 41.1 The Contractor shall ensure that his employees / workmen subject themselves to such medical examination as required under the law or under the contract provision and keep a record of the same.
- 41.2 The Contractor shall not permit any employee / workmen to enter the work area under the influence of alcohol or any drugs.

### **42.0 MEDICAL FACILITIES**

#### **42.1 Medical Examination**

- 42.1.1 The Contractor shall arrange a medical examination of all his employees including his sub-contractor employees employed as drivers, operators of lifting appliances and transport equipment before employing, after illness or injury, if it appears that the illness or injury might have affected his fitness and, thereafter, once in every two years up to the age of 40 and once in a year, thereafter.

- (i) The Contractor shall maintain the confidential records of medical examination or the physician authorized by the Employer.
- (ii) No building or other construction worker is charged for the medical examination and the cost of such examination is borne by Contractor employing such building worker.
- (iii) The medical examination shall include:
  - a. Full medical and occupational history
  - b. Clinical examination with particular reference to:
    - (i) General Physique;
    - (ii) Vision: Total visual performance using standard orthorator like Titmus Vision Tester should be estimated and suitability for placement ascertained in accordance with the prescribed job standards.
    - (iii) Hearing: Persons with normal must be able to hear a forced whisper at twenty-four feet. Persons using hearing aids must be able to hear a warning shout under noisy working conditions.
    - (iv) Breathing: Peak flow rate using standard peak flow meter and the average peak flow rate determined out of these readings of the test performed. The results recorded at pre-placement medical examination could be used as a standard for the same individual at the same altitude for reference during subsequent examination.
    - (v) Upper Limbs: Adequate arm function and grip
    - (vi) Spine: Adequately flexible for the job concerned.
    - (vii) Lower Limbs: Adequate leg and foot concerned.
    - (viii) General: Mental alertness and stability with good eye, hand and foot coordination.
  - c. Any other tests which the examining doctor considers necessary

- 42.1.2 If the Contractor fails to get the medical examination conducted as mentioned above, the Employer will have the right to get the same conducted by through an agency with intimation to the Contractor and deduct the cost and overhead charges.

**42.2 Occupational Health Centre**

The Contractor shall ensure at a construction site an occupational health centre, mobile or static is provided and maintained in good order. Services and facilities as per the scale lay down in Schedule X of BOCWR. A construction medical officer appointed in an occupational health centre, possess the qualification as laid down in Schedule XI of BOCWR.

**42.3 Ambulance van and room**

The Contractor shall ensure at a construction site of a building or other construction work that an ambulance van and room are provided at such construction site or an arrangement is made with a nearby hospital for providing such ambulance van for transportation of serious cases of accident or sickness of workers to hospital promptly and such ambulance van and room are maintained in good repair and is equipped with standard facilities specified in Schedule IV and Schedule V of BOCWR.

**42.4 First-aid boxes**

The Contractor shall ensure at a construction site one First-aid box for 100 workers provided and maintained for providing First-aid to the building workers. Every First-aid box is distinctly marked "First-aid" and is equipped with the articles specified in Schedule III of BOCWR.

**42.5 HIV/ AIDS prevention and control**

- 42.5.1 The Contractor shall adopt the Employer's Policy on "HIV / AIDS Prevention and Control for Workmen Engaged by Contractors" and the copy of the policy is given in Appendix No. 4.
- 42.5.2 The Employer will engage a professional agency for implementing the guidelines laid down in the policy and communicate to the Contractor.
- 42.5.3 The Contractor shall extend necessary support to the appointed agency by deputing the workmen to attend the awareness creation programmes.
- 42.5.4 The Contractor shall also extend necessary organizational support to the appointed agency for the effective implementation of the Employers' workplace policy on HIV/AIDS for workmen of the Contractors.
- 42.5.5 As laid down in the policy the Contractor shall identify peer educators (1 for every 100 workers) and refer them for professional training to the Employers' appointed agency for the purpose.
- 42.5.6 The peer educators on completion of the training shall serve as the focal point for any information, education, and awareness campaign among the workmen throughout the contract period.
- 42.5.7 The peer educators will be paid a monthly honorarium as fixed by the Employer for rendering his services in addition to his regular duty.
- 42.5.8 The total number of peer educators (1 for 100 workers) shall always be maintained by the Contractor.
- 42.5.9 In case if these peer educators leave the Contractor by creating vacancy, then the Contractor at his own expense train the new replacement peer educator from the Employers' appointed agency for the purpose.
- 42.5.10 It is suggested to the Contractor that due care should be taken to select the peer educators from among the group of workmen so that they remain with the Contractor throughout the contract period.

**42.6 Prevention of mosquito breeding**

42.6.1 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

- (i) Empty cans, oil drums, packing and other receptacles, which may retain water shall be deposited at a central collection point and shall be removed from the site regularly.
- (ii) There should not be accumulation of still water at any site, in case of still water, it should be covered by earth and levelled.
- (iii) Contractor's equipment and other items on the site, which may retain water, shall be stored, covered, or treated in such a manner that water could not be retained.
- (iv) Water storage tanks shall be provided.

42.6.2 Posters in Hindi and English, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the site.

42.6.3 The Contractor at periodic interval shall arrange to prevent mosquito breeding by fumigation / spraying of insecticides. Most effective insecticides shall include SOLFAC WP 10 or Baytex, The Ideal Larvicide etc.

**42.7 Alcohol and drugs**

42.7.1 The Contractor shall ensure at all times that no employee is working under the influence of alcohol / drugs which are punishable under Government regulations.

42.7.2 Smoking at public worksites by any employee is also prohibited as per Government regulations.

42.7.3 Any person suspected by the Engineer to be under the influence of alcohol or controlled substances is immediately suspended from his position by the Contractor, pending the results of medical tests.

**42.8 Access to health care**

42.8.1 The Contractor guarantees access to health care as defined in Clause 29 for all personnel in case of accident or illness occurring during the execution of the works, i.e.:

- a) Medical check ups: initial (recruitment), annual and upon returning to work after sick leave;
- b) Screening, vaccinations and preventive healthcare;
- c) General healthcare during the execution of the works;
- d) Medical assistance in the event of an accident and assistance for emergency evacuations

42.8.2 Subcontractor personnel, other contractors, the Employer or the Engineer, present at the Worksite, must never be refused medical assistance, under the pretext that they are not directly employed by the Contractor. The Contractor may however define a unit rate cost per medical act for personnel, other than its own personnel, display this rate in the healthcare centre and forward the information to the Engineer.

42.8.3 In the event of accident or serious illness, medical personnel must be trained, available and equipped with the necessary material, medicines and consumables to provide first aid for the patient, stabilise their condition, until the patient is:

- a) a) either treated or discharged, or
- b) b) hospitalized at the camp or in a larger hospital, or
- c) c) evacuated to a medical centre which is well equipped for intensive care, if necessary.

### **43.0 NOISE & VIBRATIONS**

43.1 The Contractor shall consider noise as an environmental constraint in his design, planning and execution of the Works and provide demonstrable evidence of the same on Employer's request. The Contractor shall, at his own expense, take all appropriate measures to ensure that work carried out by the Contractor and by his sub-Contractors, whether on or off the Site, will not cause any unnecessary or excessive noise which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise.

43.1.1 Without prejudice to the generality of the foregoing, noise level reduction measures shall include the following:

- a) The Contractor shall ensure that all powered mechanical equipment used in the Works shall be effectively sound reduced using the most modern techniques available including but not limited to silencers and mufflers.
- b) The Contractor shall construct acoustic screens or enclosures around any parts of the Works from which excessive noise may be generated.

43.1.2 The Contractor shall ensure that noise generated by work carried out by the Contractor and his sub-Contractors during daytime and night time shall not exceed the maximum permissible noise limits, whether continuously or intermittently. The same may be varied from time to time by and at the sole discretion of the Employer. In the event of a breach of this requirement, the Contractor shall immediately re-deploy or adjust the relevant equipment or take other appropriate measures to reduce the noise levels and thereafter maintain them at levels which do not exceed the said limits. Such measures may include without limitation the temporary or permanent cessation of use of certain items of equipment.

### **43.2 Control Requirements**

43.2.1 Construction material should be operated and transported in such a manner as not to create unnecessary noise as outlined below;

- I. Perform Work within the procedures outlined herein and comply with applicable codes, regulations, and standards established by the Central and State Government and their agencies.
- II. Keep noise to the lowest reasonably practicable level. Appropriate measures will be taken to ensure that construction works will not cause any unnecessary or excessive noise, which may disturb the occupants of any nearby dwellings, schools, hospitals, or premises with similar sensitivity to noise. Use equipment with effective noise-suppression devices and employ other noise control measures as to protect the public.
- III. Schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the construction activities and to occupants of buildings in the vicinity of the construction activities.
- IV. The Contractor shall submit to the Employer a Noise Monitoring and Control Plan (NMCP) under contract specific Site Environmental Plan. It shall include full and comprehensive details of all powered mechanical equipment, which he proposes to use during daytime and night time, and of his proposed working methods and noise level reduction measures. The NMCP shall include detailed noise calculations and vibration levels to demonstrate the anticipated noise generation and vibrations by the Contractor.
- V. The NMCP prepared by the Contractor shall guide the implementation of construction activity. The NMCP will be reviewed on a regular basis and updated as necessary to assure that current construction activities are addressed. It may appear as a regular agenda item in project coordination meetings, if noise is an issue at any location in the contract.

### **43.3 Occupational Noise**

- I. Protection against the effects of occupational noise exposure should be provided when the sound levels exceeds the threshold values.
- II. When employees are subjected to sound levels exceeding, feasible administrative or engineering controls should be utilized.
- III. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.
- IV. When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to different levels for various periods of time shall be computed according to the formula and sample computation.

### **43.4 Vibration Level**

43.4.1 In locations where the alignment is close to historical / heritage structures, the contractor shall prepare a monitoring scheme prior to construction at such locations. This scheme for monitoring vibration level at such historical / heritage sites shall be submitted to Employer for his approval. This scheme shall include:

- I. Monitoring requirements for vibrations at regular intervals throughout the construction period.
- II. Pre-construction structural integrity inspections of historic and sensitive structures in project activity.
- III. Information dissemination about the construction method, probable effects, quality control measures and precautions to be used.
- IV. The vibration level limits at work sites adjacent to the alignment shall conform to the permitted values of peak p velocity

## **44.0 VENTILATION AND ILLUMINATION**

### **44.1 Ventilation**

44.1.1 The Contractor shall ensure at a construction site of a building or other construction work that all working areas in a free tunnel are provided with ventilation system as approved by the DG/CIIBC and the fresh air supply in such tunnel is not less than 6m<sup>3</sup>/min for each building worker employed underground in such tunnel and the free air flow movement inside such tunnel is not less than 9m/min.

44.1.2 The oxygen level shall not be less than 19.5% in the working environment.

### **44.2 Illumination**

44.2.1 The Contractor shall take every effort to illuminate the work site as per the Employer's requirement illustrated in General Instruction Maha-Metro/SHE/GI/011.

44.2.2 The Contractor shall conduct a monthly illumination monitoring by lux meter for all the locations and the report shall be sent to the Employer within 7th of the next month and the same shall be reviewed during the monthly SHE committee meeting.

## **45.0 RADIATION**

45.1 The use of radioactive substances and radiating apparatus shall comply with the Government regulatory requirements and all subsidiary legislation

- 45.2 Operations involving ionising radiation shall only be carried out after having been reviewed without objection by the Employers representative and shall be carried out in accordance with a method statement.
- 45.3 Each area containing irradiated apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.
- 45.4 Radioactive substances will be stored, used, or disposed shall be strictly in accordance with the Government Enactments.
- 45.5 The Contractor shall ensure that all site personnel and members of the public are not exposed to radiation.

#### **46.6 Asbestos**

Asbestos fibres are naturally occurring and extremely aerodynamic. Because of this, almost everyone is exposed to asbestos. Asbestos fibres can become a health risk if inhaled at high concentrations over extended periods of time. Asbestos is only dangerous if it becomes airborne. As long as asbestos-containing materials are not damaged, the asbestos fibres do not become airborne, and do not pose a health hazard to building occupants.

As a preventive action, no asbestos containing material will be used during any of the site activity mitigate the hazard

#### **46.7 Lead-Based Paint**

Lead-based paint is a source of lead poisoning. Ingestion and inhalation of lead dust that is created as lead-based paint chips and peels, or from improper sanding or scraping of lead-based painted surfaces can lead to exposure.

Paints and other chemicals used for painting should be stored in a proper contained area. Empty Paint containers, waste paint brushes, clothes stained with paint shall be disposed as per prevailing regulations.

### **46.0 WELFARE MEASURES FOR WORKERS**

#### **46.1 Latrine and Urinal Accommodation**

- 46.1.1 The Contractor shall provide one latrine seat for every 20 workers up to 100 workers and thereafter one for every additional 50 workers. In addition, one urinal accommodation shall be provided for every 100 workers.
- 46.1.2 When women are employed, separate latrine and urinals accommodation shall be provided on the same scale as mentioned above.
- 46.1.3 Latrine and urinals shall be provided as per Section 33 of BOCWA and maintained as per Rule 243 of BOCWR and shall also comply with the requirements of public health authorities

#### **46.1.4 Moving sites**

In case of works like track laying, the zone of work is constantly moving at elevated level or at underground level. In such cases mobile toilets with proper facility to drain the sullage shall be provided at reasonably accessible distance.

- 46.1.5 In case if the Contractor fail to provide required number of urinals and latrines or fail to maintain it as per the requirements of Public Health laws, the Employer shall have the right to provide/maintain through renowned external agencies at the cost of the Contractor.

#### **46.2 Canteen**

In every workplace wherein not less than 250 workers are ordinarily employed, the Contractor shall provide an adequate canteen conforming to Section 37 of BOCWA, Rule 244 of BOCWR

and as stipulated in Rule 247 of BOCWR the changes for food stuff shall be based on 'no profit no loss' basis. The price list of all items shall be conspicuously displayed in such canteen.

#### **46.3 Serving of tea and snacks at the workplace**

As per Rule 246 of BOCWR, at a building or other construction work where a workplace is situated at a distance of more than 200 m from the canteen provided under Rule 244(1) of BOCWR, the Contractor employing building works shall make suitable arrangement for serving tea and light refreshment to such building works at such place. Proper Housekeeping should be maintained at such locations where tea and snacks are served.

#### **46.4 Drinking water**

46.4.1 As per Section 32 of BOCWA the Contractor shall make in every worksite, effective arrangements to provide sufficient supply of wholesome drinking water with minimum quantity of 5 litres per workman per day. Quality of the drinking water shall conform to the requirements of national standards (IS 10500) on Public Health.

46.4.2 While locating these drinking water facilities due care shall be taken so that these are easily accessible within a distance of 200m from the place of work for all workers at all location of work sites.

46.4.3 All such points shall be legible marked "Drinking Water" in a language understood by a majority of the workmen employed in such place and such point shall be situated within six metres of any washing places, urinals, or latrines.

#### **46.5 Labour Accommodation**

The Contractor shall provide free of charges as near as possible, temporary living accommodation to all workers conforming to provisions of Section 34 of BOCWA. These accommodations shall have cooking place, bathing, washing and lavatory facilities

#### **46.6 Creches**

In every workplace where in more than 50 female workers are ordinarily employed, there shall be provided and maintained a suitable room for use of children under age of 6 yrs, conforming to the provisions of Section 35 of BOCWA.

#### **46.7 Heat Stress**

Contractors/Subcontractors shall establish the necessary programs to ensure that project employees work safely in heat stress conditions. The reduction of adverse health effects can be accomplished by engineering controls, work practices, training, acclimatization, monitoring, water and electrolyte balance and the recognition and treatment of heat stress emergencies.

#### **46.8 First aid**

The Contractor ensures that at least one first aid officer is present at all times during working hours, per shift for 10 to 50 workers present, and one extra first aid officer for each additional 100 workers allocated to the shift.

The Contractor equips the Worksite with a communication system exclusively for the purposes of communication with the first aid services. Information on how to communicate with the first aid services is clearly indicated near the communications equipment.

#### **46.9 Pandemic (National Disaster as Covid-19/Omicron etc.)**

1. All the workmen shall be sensitized on the hygiene and other work requirements like social distancing before being engaged for the work.
2. Body temperature need to be monitored by infrared thermometer before being engaged for the work



3. Work area need to be displayed with COVID-19 symptoms, Do's & Don'ts issued by local authorities.

#### **46.9.1 Safety Motivational & Awareness Campaign:**

1. Posters about COVID-19 for workplace must be displayed to help staffs and workers to stay informed, have accurate information, and know how to perform in working area to protect themselves and other.
2. Initiatives / Campaigns must be organised to protect the employees and labours against the risk of coronavirus infection. This is applied to both indoor (Labour Camps, Accommodation's) and outdoor accommodation.
3. All areas in the premises including Office, stores Labour camps shall be disinfected completely with the use of approved disinfectant mediums.
4. The workmen welfare facilities including Labour accommodations, Rest areas, Toilet facilities, drinking water facilities shall be inspected for adequate precautions especially from Hygiene and social distancing point of view, by the Contractor to ensure their adequacy.

#### **46.9.2 Reporting of Covid-19**

1. A Daily report regarding COVID-19 status must be sent to Maha-Metro for updating of Positive cases, suspected cases, and their control measures to face the challenge and threat posed by the growing pandemic of COVID-19.
2. On daily basis, COVID-19-Follow-up & reporting system must be carried out to the latest numbers on Covid tests, Covid cases status (Negative or Positive), hospitalizations, and patient outcomes from contractors ends.

46.9.3 The following reports must be submitted by the contractors on daily basis who will further scrutinize, compile and forward to Maha metro and to local authorities (as directed by Maha metro).

1. Details of workmen who is get affected by Covid-19 Virus.
2. Status of health of affected workmen and submit the health report by medical expert.
3. Details of Workmen engaged who are from outside Maharashtra
4. Emergency Preparedness & Response report

#### **46.9.4 General Precautionary measures**

1. Ensure Social Distancing by Restriction in gathering of 5 or more in workplaces and public places. Large meeting to be prohibited and large gathering of more than 10 people in workplaces is discouraged. Seating arrangement shall be at least 6 feet from each other.
2. Wearing face-cover/musk at public places & workplaces
3. Spitting in workplaces / public places shall be punishable with fine.
4. Ban on liquor, Gutka, and tobacco in workplaces
5. Temperature screening during entry and exit to be done.
6. Sanitizers and hand wash facility shall be made available at convenient places at worksites
7. Staggered lunch breaks to ensure social distancing
8. Persons above 65 years, persons with co-morbidities, parents of children below the age of 5 should be encouraged to work from home.
9. Daily Sanitize/disinfect the workplace
10. Vehicles with 30-40% passenger capacity
11. 2/4 (depending on the size) will be allowed to travel in lifts/hoists
12. Restrict / Ban non -essential visitors
13. List of authorized hospitals/clinics nearby areas to treat COVID 19 to be executed.

#### **46.9.5 Isolation Room/Quarantine Centre**

The Contractor shall provide an Isolation Room/ Quarantine Centre if some one found symptoms of virus or get affected positive.

## **PART- IV ENVIRONMENTAL MANAGEMENT**

### **47.0 ENVIRONMENTAL MANAGEMENT**

Environmental Management is an essential part of the overall Environmental protection system employed by Maha Metro for the construction of Pune Metro Rail project and shall apply to all contract packages i.e. Civil, Track, E&M and System contracts subject to activities involved in respective packages.

### **48.0 TOPSOIL CONSERVATION**

- 48.1 The contractor shall ensure that adequate measures are taken for the prevention of erosion of the topsoil during the construction phase.
- 48.2 The contractor should maintain the record of topsoil quantity excavated from construction from all locations where vegetation existed prior to construction. The record shall include photographic evidence of the topsoil quantity excavated.
- 48.3 Top soil should be stripped to a depth of 20 cm from the areas to be disturbed, it should be stockpiled to a maximum height of 40 cm in designated areas, covered or stabilized with temporary seeding for erosion prevention and should be reapplied to site during plantation of the proposed vegetation. Topsoil should be separated from subsoil, debris and stones larger than 50mm diameter. The stored topsoil may be used as finished grade for planting areas.

### **49.0 FELLING OF TREES & TREE PRESERVATION**

- 49.1 The contractor shall identify the number and type of trees that are required to be felled as a result of construction of works and facilities related to Pune Metro Project and inform the Employer.
- 49.2 All trees and shrubbery, which are not specifically required to be cleared or removed for construction purposes, shall be preserved and shall be protected from any damage that may be caused by Contractor's construction operations and equipment. The contractor shall not fell, remove or dispose of any tree or forest produce in any land handed over to him for the construction of works and facilities related to Pune Metro except with the previous permission obtained from the Forest Department or other Competent Authority.
- 49.3 The contractor shall ensure that no tree, existing or otherwise, shall be harmed and damage to roots during trenching, placing backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health.
- 49.4 The contractor shall avoid cut and fill in the root zones.
- 49.5 Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the Contractor shall adequately protect such trees by use of protective barriers or other methods approved by the Employer. Trees shall not be used for anchorage.
- 49.6 Trees should be protected around 1m periphery by providing tree guard and no construction or storage of materials shall be carried out within its premise.

### **50.0 FLY ASH**

- 50.1 The contractor shall use fly ash as a percentage substitution of cement, in concrete for certain structures and works as prescribed in the latest MoEF&CC fly ash notification dated September 1999 and its subsequent amendments.
- 50.2 As per the notification, only fly ash based products shall be used for construction such as cement or concrete, fly ash bricks or blocks or tiles or clay fly ash bricks, block or tiles or cement fly ash

bricks or bricks or blocks or similar products or a combination or aggregate of them. The contractor shall provide details of usage of such products to employer.

- 50.3 In all such uses of Fly Ash, the contractor shall maintain a detailed record of usage of Fly Ash. The contractor shall also collect related details and provide to the Employer.

## 51.0 CONTAMINANT OF AIR POLLUTION

### 51.1 At Construction Site

- 51.1.1 The Contractor shall erect barricades securely around all construction work sites during the entire phase of construction activity, to contain dust within the site area and also to reduce air turbulence caused by passing traffic.
- 51.1.2 Barricades are to be installed on either side of the road or at the centre of the road median.
- 51.1.3 Barricades are also required at work sites around the periphery of which are located residential or commercial property.
- 51.1.4 The barricades shall be safely secured to the ground to prevent from toppling. There shall be no gap between bottom of barrier and ground/road. The barrier shall be placed at all times till there is likelihood of dust escaping from the site or material being stored at the site.
- 51.1.5 In case of construction work located near residential or commercial properties, the contractor shall erect barricade of suitable approved material around the entire construction site of height not more than 10m or 1/3rd of building height whichever is less, having acoustic properties, apart from providing relief from dust. There should be no gap in the enclosure erected by the barrier except at entry and exit to or from site.
- 51.1.6 The barricading material if used as noise barrier shall conform to have following acoustic properties:

**Table 1.1 Properties of Noise Barrier**

Barrier type	Absorptive
Life span	At least 3-4 years
NRC	More than 0.75
Insertion Loss	10 dBA

- 51.1.7 The barrier material shall be light weight, weatherproof, fire resistant and easy to maintain. The supporting frames and mountings should also be light weight and easy to install.
- 51.1.8 Before the start of work, the Contractor shall provide wet automated wheel washing facility with two stage sedimentation tank at the exit of Batching Plant, Casting Yard, and Underground stations. It shall also be provided at off the road elevated stations. At other locations i.e. viaduct, on the road elevated stations etc. where there are space restrictions, the contractor shall adopt dry wheel cleaning mechanism with prior approval from employer. If work site contains multiple exits, then wheel washing facility shall be provided for all these exits where vehicle carrying construction materials or trucks or vehicles or plant/machinery transit from construction site on to live public roads. The wheel wash shall be located as close to the exit gate, as possible. However, care to be taken to ensure that the surface from wheel wash to exit gate is either bitumen or concrete paved. The contractor shall ensure the wheel washing facility remains functional till the end of contract.
- 51.1.9 At such facility, high-pressure water jets will be directed at the wheels of vehicles to remove all spoil and dirt. Water shall be pumped through an electrically operated pump set, to hydrants attached with rubber hoses, by activation of push button located at the hydrant, allowing for up to 10 minutes of wash time.

- 51.1.10 Wheel washing facility shall be provided with efficient drainage, incorporating silt traps to prevent any excessive build-up of water. These facilities should include water re-circulation mechanism to minimise water consumption.
- 51.1.11 At the wheel wash facility, water, dirt, gravel etc. shall be drained into precast trench drains with removable grated cover. This dirty water shall flow, through a piping, into solids separator and from there to oil separator before final discharge.
- 51.1.12 At each construction site including batching plant and casting yard, the Contractor shall provide storage facilities for dust generating materials which shall be closed containers/bins or wind protected shelters or mat covering or walled or any combination of the above to the satisfaction of the Employer. Suitable sprinkling system shall be installed and operationalized in this area. The quality of water for sprinkling shall be the same as used for concrete batching.
- 51.1.13 The contractor shall not store any construction material/debris/soil outside barricaded area.
- 51.1.14 Soil, sand, aggregate, debris of any kind and all dust prone material that is stored at site will be fully covered with tarpaulin or hessian cloth in all respects with proper anchorage so that it does not disperse in the air in any form.
- 51.1.15 The dust emissions from the construction site should be completely controlled and all precautions taken in that behalf.
- 51.1.16 The Contractor shall use nozzle based mist system at construction sites such as elevated station, underground station, launching shaft, depot, retrieval shaft, batching plant & casting yard as required to suppress dust.
- 51.1.17 Nozzle based mist system shall also be used during the delivery and handling of sand and aggregate and other similar materials, when dust is likely to be generated.
- 51.1.18 At sites where the sprinkling is to be carried out manually, sprinkling will be carried out at a frequency of at least thrice a day or as directed by engineer in charge. For dust suppression contractor shall use, STP treated water or RO reject or treated water from sedimentation tank. Use of fresh water to be refrained.
- 51.1.19 Stockpiles of sand and aggregate greater than 20m<sup>3</sup>, used for concrete manufacturing, shall be enclosed on three sides, with walls extending above the height of stockpile and two (2) meters beyond the front of the stockpile. The contractor shall provide sprinkler system in sand and aggregate storage area and the water for sprinkling shall be of the same quality as used for concrete batching.
- 51.1.20 Areas within the site such as casting yard and batching plant, where there is a regular movement of vehicles shall have an approved hard surface (PCC) that is kept clear of loose surface material.
- 51.1.21 Unless the Employer has given consent otherwise, the Contractor shall restrict all motorised vehicles on the site to a maximum speed of 10 kilo-meter per hour and vehicles shall move on designated path.
- 51.1.22 The contractor shall use wet-jet in grinding and stone cutting works with two stage sedimentation tank facility to recycle/re-use the water. The water from the final chamber of sedimentation tank shall be reused.
- 51.1.23 In the event recorded PM10 level is greater than the base line/Limit levels, the Employer may direct the Contractor to take effective remedial measures including, but not limited to, reviewing dust sources and modifying working procedures.
- 51.1.24 Where the recorded baseline levels exceed the ambient air quality standards, then at such locations the baseline level shall be considered as limit level. Contractor shall take all effective remedial measures to contain the levels to their limit level as a result of his activities.

51.1.25 If the measures to control air pollution are found to be ineffective, the employer may issue stop work order till the time remedial measures are found to be effective to the satisfaction of employer.

51.1.26 At the Batching plant the following additional conditions shall be complied with:

- a) The contractor shall not install Star Batcher Concrete Batching Plant for manufacturing/producing concrete.
- b) Inside the batching plant, ground surface must be paved with Cement Concrete. The plant shall have proper drainage system with outlet connected to two stage sedimentation tank. No dust shall be allowed to deposit on road inside Batching plant.
- c) The contractor shall procure cement through bulker instead of conventional cement bags.
- d) Continuous dust/wind breaking barricades of height at least 6 meters around the batching plant shall be constructed of suitable material which will act as boundary wall.
- e) If the batching plant is located near the residential area, then the boundary wall shall be acoustically treated to act as noise barrier also. In such event the property of boundary wall cum noise barrier will conform to specification given in para 51.1.6 above.
- f) The contractor shall provide sufficient number of openings in the cement godown/cement feeding area with industrial grade exhaust fans with ducting system. The ducts shall be connected to a container filled with water.
- g) The contractor shall cover the conveyor belt used for carrying aggregate.
- h) Nozzle based mist system shall be used during the delivery and handling of sand and aggregate and other similar materials, when dust is likely to be generated and to dampen all stored materials.
- i) The contractor shall provide and ensure dust masks (proper PPEs) to all workers/labour/staff working at batching plant.
- j) The Contractor shall undertake at all times the prevention of dust nuisance as a result of his activities.
- k) The Contractor shall frequently clean and water the concrete batching plant and crushing plant sites and ancillary areas to minimise any dust emission.

51.1.27 Minimum stack height of DG set shall be as given in Central Pollution Control Board (CPCB) Emission Regulations Part IV: COINDS/26/1986- 87 and Emission Standards for Diesel Engines (Engine Rating more than 0.8 MW (800 KW) which were notified by the Environment (Protection) Third Amendment Rules 2002, vide G.S.R. 489 (E), dated 9th July, 2002 at serial no. 96, under the Environment (Protection) Act, 1986 and its amendments.

51.1.28 Consent for height of stacks of Diesel Engines with rating more than 800 KW shall be obtained by the Contractor from statutory Government agency. Where the calculated height of stack is obtrusive and does not blend with the neighbourhood, the contractor could provide either alternative source of power or provide a solution that is acceptable to the employer. This may include but not limited to providing appropriate cladding for the stack.

51.1.29 Contractor's transport vehicles and other equipments shall conform to emission standards fixed by Statutory Agencies of Government of India or the State Government from time to time. The contractor shall carry out periodical checks and undertake remedial measure including replacement, if required so as to ply within permissible norms.

51.1.30 Contractor shall provide green net for dust control at construction sites i.e stations, viaduct, depot, batching plant, casting yard, at the top of barricade boards near residential/commercial and sensitive areas. These should be of sufficient height and firmly secured so as to prevent escape of dust to residential/ commercial and industrial areas.

51.1.31 To avoid dust generation during drilling and grinding, it is preferred to use drilling machine, angle grinder and floor grinder connected to a vacuum cleaner. The dust collected in the vacuum cleaner should be disposed off without causing air pollution.

51.1.32 All Air Conditioner's shall confirm the ozone depleting substances (Regulation and Control) Rules, 2000.

51.1.32 The Contractor shall protect structures, utilities, pavements roads and other facilities from disfiguration and damage as a result of his activities. Where this is not possible, the contractor shall restore the structures, utilities, pavements, roads and other facilities to their original or better, failing which the rectification/restoration work shall be carried out at the risk and cost of the contractor.

## **51.2 During Handling of excavated earth**

51.2.1 Storage of Excavated earth should be such that it's maximum height shall be 0.5 m below the barricading height.

51.2.2 Excavated earth shall be covered with tarpaulin sheets which are firmly secured to the ground, as long as it is stored at site.

51.2.3 If the excavated material is to be stored for long duration, dust containment measures like growing grass should be adopted.

## **51.3 During Transport of Material/muck/soil/C&D Waste (Debris)**

51.3.1 The Contractor shall take precautions to minimise visible particulate matter from being deposited upon public roadways as a direct result of his operations. Toe dust along the barricade shall be cleaned regularly at least once a day.

51.3.2 The vehicle carrying construction materials and construction debris of any kind should be cleaned in all respect before it is permitted to ply on the road.

51.3.3 The contractor shall take precaution against spillage of concrete on road from transit mixer by providing collection bag at end point discharge chute

51.3.4 Any deposition of material/muck/soil on public streets due to construction should be promptly removed by manual sweeping, or by deploying electro – mechanical devices.

51.3.5 Trucks carrying construction material, excavated earth and debris shall be fully covered and protected so as to ensure that these materials do not get dispersed into the air or atmosphere, in any form whatsoever or fall off the vehicle. Such trucks carrying construction material shall not be permitted to leave the site until this requirement is met.

## **51.4 At Dumping Sites**

51.4.1 The dumping sites should be temporarily barricaded by the contractor or as per provisions in the Employer's Requirements on Construction. The contractor shall provide wheel cleaning mechanism at the exit gate of dumping site.

51.4.2 The Contractor shall place excavated materials in the dumping / disposal areas approved by Employer.

51.4.3 The Contractor shall place material in a manner that will minimise dust generation. Material shall be stabilised each day by watering or other acceptable dust suppression techniques.

51.4.5 The heights from which materials are dropped shall be the minimum practical height to limit fugitive dust generation.

51.4.6 The Contractor shall stockpile material in the Employer designated locations with suitable slopes. Access to the site shall be regulated for entry of men, material and machine.

- 51.4.7 The contractor should cover the surface with grass to prevent dust generation during summer months and erosion in rainy period.
- 51.4.8 The Contractor shall provide water sprinkling at any time that it is required for dust control use.
- 51.4.9 Sufficient equipment, water, and personnel shall be available at dumping sites at all time to minimise dust formation and to prevent nuisance.
- 51.4.10 Dust control activities shall continue even during work stoppages.

## **52.0 CONTAINMENT OF WATER POLLUTION AND CONSERVATION OF WATER**

- 52.1 The Contractor shall provide digital water meters at all the bore wells, inlets and outlets of RO plants, dewatering outlets, municipal water delivery points and other suitable locations to record the accurate figures of water extraction and consumption for various purposes and submit the details. The contractor shall obtain necessary permission for extracting ground water from relevant government agency.
- 52.2 At underground construction site and dumping sites, temporary drainage works shall be maintained, removed and reinstated as necessary and all other necessary precautions should be taken for avoidance of damage by flooding and silt.
- 52.3 Temporary open storage of excavated materials from cut and cover and tunnelling work used for backfill at site should be covered with tarpaulin which is firmly secured to ground.
- 52.4 Polymer slurry or other grouts used in diaphragm wall construction piling and other concrete works shall be collected in a separate slurry collection system. If reuse is not practicable then it shall only be disposed off at nearest landfill site after obtaining permission from agency owning the landfill and under the conditions imposed by the agency concerned, or to a different disposal location as advised by the Employer. Record of disposal of Polymer slurry at landfills or elsewhere shall be maintained by the contractor and reported in the contractor's Monthly Environment Report to be shown to employer when requested.
- 52.5 Beneath the hopper of Batching Plant, the slope of the surface shall be maintained in a such a way that the slurry from Batching Plant shall enter into sedimentation tank. The area should be cleaned regularly to avoid slush generation.
- 52.6 Any mud slurry from drilling, tunnelling, diaphragm wall construction or grouting etc. shall not be discharged into the drainage system unless treatment is carried out that will remove silt, mud particles etc. The Contractor shall provide treatment facilities as necessary to prevent the discharge of contaminated ground water.
- 52.7 The Contractor is not allowed to discharge water from the site without the approval of the Employer. The Contractor must comply with the requirements of the Central Ground Water Board for discharge of water arising from dewatering. Any water obtained from dewatering systems installed in the works must be either re-used for construction purposes or recharged to the ground or pumped into the nearest water body/park or supplied to concerned authority with prior permission of the Employer. In case, the dewatered water is required to be used for reuse in construction or recharge, the Contractor must submit his proposals for prior approval of Employer along with, his proposed locations of dewatering.
- 52.8 Roof top run-off from casting yard and batching plants as well as water from curing (if, any) should be conserved through properly designed rainwater harvesting structures via adequately designed sand/silt removal facilities such as sand traps, silt traps or sediment basins. Excess discharge should be discharged into storm drains.
- 52.9 Perimeter channels/drains shall be constructed in casting yard and batching plant. Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, to ensure that these facilities are functioning properly at all times.

- 52.10 Oil separator/interceptors shall be provided to prevent the release of oil and grease into the drainage system. These shall be cleaned on a regular basis. Area which is storing admixtures/oils should be connected to a drainage system with a oil & grease trap. Spillage of material during transfer should be avoided by using appropriate /design mechanism for such transfer.
- 52.11 Measures should be taken to minimize the ingress of rainwater into trenches. If excavation of trenches in wet seasons is necessary, they should be dug and backfilled in short sections. Rainwater pumped out from trenches or foundation excavation should be discharged into storm drains via silt removal facilities.
- 52.12 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system. Discharge of surface run-off into sewers must always be prevented in order not to unduly overload the sewerage system.
- 52.13 The drainage system should cover the entire area of Casting Yard/ Batching Plant. The drainage system shall be designed in such a way that it should have sufficient capacity to hold the runoff of the catchment area.
- 52.14 Waste water from Reverse Osmosis (RO) plant shall be used only for dust suppression, wheel washing and road washing. It shall not be drained into public sewers or storm water drainage system.
- 52.15 The Contractor may discharge wastewater arising from site offices, canteens or toilet facilities constructed by him into sewers after obtaining prior approval of agency controlling the system.
- 52.16 The Contractor shall provide adequate precautions to ensure that no spoil, wastewater, spills or debris of any kind is pushed, washed, falls or deposited on land adjacent to the site perimeter including public roads or existing stream courses water bodies (Natural /artificial), ground water and drains within or adjacent to the site. In the event of any spoil, wastewater, spills and debris from construction works being deposited or any silt washed down to any area, then all such spoil, wastewater, spills debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Contractor to the satisfaction of the Employer.

### 53.0 CONTAINMENT OF NOISE AND VIBRATION

- 53.1 Construction often generates community noise/vibration complaints despite the limited time frame over which it takes place. Complaints typically arise from interface with people's activity, especially when community has no clear understanding of the extent or duration of construction.
- 53.2 This situation underscores the need for early identification and assessment of potential problem areas. An assessment of the potential for complaints can and should be made.
- 53.3 If done timely, such assessment can aid contractor in allowing changes in construction approach and reduce noise mitigation cost before the construction plans are finalised.
- 53.4 The contractor shall conform to ambient air quality standards/Baseline results with respect to noise.
- 53.5 The Employer will monitor noise level at site before the start of work and share the values with contractor. Thereafter, the contractor will employ necessary engineering control to ensure that noise levels do not exceed preconstruction noise.
- 53.6 Where there are no ambient noise measurements, the noise levels from construction activities shall be limited to levels measured near the construction site as given in table below:

**Table 1.2.: Allowable Construction Noise**

S. No	Land Use	Maximum Noise Levels (Leq- 5min)
1	Industrial	75
2	Residential and Other areas	65



- 53.7 To the extent required to meet the noise limits, the Contractor shall use reasonable efforts to include noise reduction measures listed below to minimize construction noise emission levels. Noise reduction measures – include, but not limited to the following:
- i. Acoustic barriers should be placed near construction sites. The properties of acoustic barrier are given in Table 1.1.
  - ii. Minimize the use of impact devices, such as jackhammers, and pavement breakers. Equip noise producing equipment such as jackhammers and pavement breakers with acoustically attenuating shields or shrouds recommended by the manufacturers thereof, to meet relevant noise limitations.
  - iii. Pneumatic impact tools and equipment used at the construction site shall have intake and exhaust mufflers recommended by the manufacturers thereof, to meet relevant noise limitations.
  - iv. Provide mufflers or shield panelling for other equipment, including internal combustion engines, recommended by manufacturers thereof.
  - v. Use construction equipment manufactured or modified to dampen noise and vibration emissions, such as:
    1. Use hydraulic tools instead of pneumatic impact tools.
    2. Maximize physical separation, as far as practicable, between noise generators and noise receptors such as locating stationary equipment so as to minimize noise and vibration impact on community.
    3. Use of electric powered equipment instead of diesel-powered equipment.
  - vi. Schedule work to avoid simultaneous activities that generate high noise levels.
- 53.8 The contractor shall provide enclosures for stationary equipment and noise barriers around particularly noisy areas on site depending upon the land use.
- 53.9 To the extent feasible, configure the construction site in a manner that keeps noisier equipment and activities as far as possible from noise sensitive locations and nearby buildings. Plant and equipment known to emit noise in one direction should where possible, be oriented in a direction away from noise sensitive receptor and reduce the number of plant and equipment operating in critical areas close to noise sensitive receptors.
- 53.10 Schedule truck loading, unloading, and hauling operations so as to minimize noise impact near noise sensitive locations and surrounding communities.
- 53.11 Other measures that the contractor may adopt to mitigate noise include:
- a) Minimize noise intrusive impacts during most noise sensitive hours.
  - b) Plan noisier operations during times of highest ambient noise levels
  - c) Keep noise levels relatively uniform; avoid excessive and impulse noises.
  - d) Equipment and plant should not to be kept idling when not in use.
  - e) Use only well-maintained plant & equipment at site, which should be serviced regularly.
  - f) Shall maintain equipment such that parts of vehicles and loads are secured against vibrations and rattling
  - g) Conduct truck loading, unloading and hauling operations in a manner such that noise and vibration are kept to a minimum.
  - h) Route construction equipment and vehicles carrying soil, concrete or other materials over streets that will cause least disturbance to residents in vicinity of work.
  - i) Avoid operating truck on streets that pass by schools during school hours
  - j) Select truck routes for muck disposal in such a way that noise from heavy-duty trucks will have minimal impact on sensitive land uses (e.g., residential) and submit the proposed routes to the Employer for approval.

- 53.12 If back-up alarms are used on construction equipment, their noise level near noise sensitive receptors such as residences, schools, hospitals and similar areas where silence is essential, should be regulated, especially at night time. Visual alarms shall preferably be used during night time operation.
- 53.13 The contractor shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper setting and control measures.
- 53.14 Installation of a DG set must be strictly in compliance with the recommendations of the DG set manufacturer. The contractor shall ensure that all necessary permissions/ approvals/consent is obtained from relevant authorities before installation and operation of Generator set.
- 53.15 A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.
- 53.16 The maximum permissible sound pressure level for new diesel generator (DG) sets (upto 1000 KVA) manufactured on or after the 1st July,2003 shall be 75 dB(A) at 1 metre from the enclosure surface. The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.
- 53.17 Noise limit for DG sets not covered by above paragraph shall be as follows:
- Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the user's end.
  - The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction up to actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/room, and then averaged.
  - The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A)
- 53.18 If the measures to control noise pollution are found to be ineffective, the employer may issue stop work order till the time remedial measures are found to be effective to the satisfaction of employer.
- 53.19 Vibration consists of rapidly fluctuating motions with an average motion of zero. During vibration the oscillatory waves propagate from the source through the ground to adjacent buildings. Vibration from construction projects is caused by general equipment operations is usually highest during pile driving, soil compacting, jack hammering and construction related demolition activities.
- 53.20 The following steps may be taken by the contractor to reduce construction vibration:
- A. Design considerations and project layout:**
    - Route heavily loaded trucks away from residential streets.
    - If possible, select street with fewest homes, if no alternatives are available.
    - Operate earthmoving equipment on the construction lot as far away from vibration sensitive sites as possible.
  - B. Sequence of operations:**
    - Phase demolition, earthmoving and ground-impacting operations so as not to occur the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately.
    - Avoid night time activities. People are more aware of vibration in their homes during the night time hours.

**C. Alternative construction methods:**

1. Avoid impact pile driving where possible in vibration-sensitive areas.
2. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use.
3. Select demolition methods not involving impact, where possible. For example, sawing bridge decks into sections that can be loaded onto trucks results in lower vibration levels than impact demolition by pavement breakers, and milling generates lower vibration levels than excavation using clam shell or chisel drops.
4. Avoid vibratory rollers and packers near sensitive areas.

**54.0 WASTE MANAGEMENT**

**54.1 General:** The following types of waste are most likely to be encountered during execution of contract:

1. General refuse
2. C&D waste
3. Hazardous waste
4. E-waste
5. Bio medical waste
6. Plastic waste
7. Batteries Waste

54.1.1 Disposal of waste as per legal requirement is found in the table below:

**Table 1.3: Construction Wastes – Type and Disposal**

S.No	Waste Type	Legal requirement for handling, storage & disposal
1.	General refuse	Solid Waste Management Rules, 2016 and its amendments
2.	Vegetation / Timber etc.	The Maharashtra (Urban Areas) Preservation of Trees Act, 1975 and its amendments
3.	Construction and Demolition (C&D) waste	Construction and Demolition Waste Management Rules, 2016 and its amendments and/or any suitable means acceptable to Maha-Metro/Engineers
4.	Hazardous waste	Hazardous and Other Wastes (Management & Trans-boundary Movement) Rules, 2016 and its amendments
5	Electronic waste	E-waste (Management) Rules, 2016 and its amendments
7.	Bio-medical waste	Bio-medical waste Management Rules, 2016 and its amendments
8.	Chemical waste	Manufacture, Storage and handling of hazardous chemical rules 1989 and its amendments
9.	Plastic Waste	Plastic Waste management Rules, 2016 and its amendments

54.1.2 In addition to above, excavated earth and metal scrap is likely to be generated in large quantity. The excavated material comprises mainly soil and rock. Soil may be used for backfill at locations as directed by employer.

54.1.3 The contractor is required to develop, institute and maintain a Waste Management Programme (WMP) during the construction of the project for his works. This WMP shall be a part of Contractor's site Environmental Management Plan. Data sheet to be provided under WMP. However, the WMP should be prepared and submitted to the Engineer for approval. A Waste

Management Plan specific for handling and disposal of C&D waste shall be prepared separately by the contractor as per the provisions of C&D Waste Management Rules, 2016 or any other means acceptable to the engineers.

- 54.1.4 A mechanism is required to ensure that designated areas for the segregation and temporary storage of reusable, recyclable and waste materials are incorporated into the WMP.
- 54.1.5 The Contractor shall handle waste in a manner that ensures they are held securely without loss or leakage thus minimizing potential for pollution following all legal requirements for handling and storage. The Contractor shall maintain and clean waste storage areas regularly.
- 54.1.6 The contractor shall strictly manage transportation and disposal of all waste complying all legal/statuary requirements.
- 54.1.7 The contractor shall make available Material Supply Data Sheet (MSDS) for material/chemicals/substances used, for which these are available to the Employer when requested.

## **54.2 General Refuse**

- 54.2.1 This category of waste is generated from living camps, offices, workshops, kitchen, and other work areas. Such type of waste includes food scraps (solids + liquids), Paper, Cardboard, Plastics (recyclable bottles, other), Glass (different colours), Aluminium and other cans, Wooden boxes, crates etc.
- 54.2.2 The Contractor shall provide at site, metal or heavy-duty plastic 'Refuse Containers' with tight fitting lids for disposal of all garbage or trash associated with food. The containers shall not have openings that allow access by rodents.
- 54.2.3 To keep the area free of litter and garbage, specific locations shall be designated for consuming food and snacks to prevent random disposal of waste. All waste shall be deposited in the refuse containers. Suitable all-weather signage shall be prominently displayed for compliance of these requirements.
- 54.2.4 The refuse containers shall be kept upright with their lids shut. These containers shall be emptied at least once daily by the Contractor to maintain site sanitation. There shall be different containers for each category of waste.
- 54.2.5 General refuse should be stored in enclosed bins or units separate from construction and chemical wastes. A waste collector should be employed by the contractor to remove general refuse from the site on a daily basis to minimise odour, pest and litter impacts.
- 54.2.6 Handling and disposal of general refuse should cope with the peak construction workforce during the construction period. The refuse should be stored and transported in accordance with good environment practice and disposed at licensed landfills.
- 54.2.7 Respective Waste with residual value is to be disposed off by selling to recyclers. The remaining can be disposed off through collection and disposal by local municipal agency.
- 54.2.8 Office waste can be reduced through recycling of paper if volumes are large enough to warrant collection.
- 54.2.9 Burning of refuse at construction site is not permitted. Dumping of any type of waste is strictly prohibited along any of the river bed.
- 54.2.10 Colour Coded Dustbin in suitable numbers at each working area shall be used for segregation of waste during collection. The waste management plan should clearly quantify and identify the number and locations of different types of dustbins that will be provided at each working site. Colour coding of dustbins shall be as per given Table:

**Table 1.4 - Colour Coding of Dust Bins**

Type of Waste	Colour
Wet/Organic/ Bio-Degradable Waste	Green Bins with lids
Dry/Recyclable waste (excluding Bio-medical waste/ hazardous waste)	Blue
Bio-Medical waste	As per Bio-medical waste Management Rules, 2016
E-Waste	Black
Hazardous Waste	Fluorescent yellow colour background wrien in RED words as 'HAZARDOUS WASTES' and 'HANDLE WITH CARE' in Hindi, English and vernacular language
COVID Waste	Yellow

**54.3 Construction and Demolition Waste**

54.3.1 Construction and Demolition waste" means the waste comprising of building materials, debris and rubble resulting from construction, re- modelling, repair and demolition of any civil structure.

54.3.2 Construction & Demolition (C&D) waste shall be stored at a designated area.

54.3.3 The C&D waste shall be disposed off in a manner in compliance with the procedure given in the Construction & Demolition Waste Management Rules, 2016. or any other means with prior approval of Maha-Metro/Engineer.

54.3.4 The contractor shall be responsible for collection, segregation and storage of construction and demolition waste, as directed or notified by the concerned local authority in consonance with the Construction& Demolition Waste Management Rules, 2016.

54.3.5 The contractor shall ensure that other waste does not get mixed with this waste and is stored and disposed separately.

54.3.6 The contractor shall dispose C&D waste only at authorized processing facilities/pre approved dumping locations and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.

54.3.7 Disposal of C&D waste along the river bed, natural drainage and wet land is strictly prohibited and the contractor shall be fined for non compliance of this requirement.

54.3.8 The requirement of concrete/RCC/PCC waste disposal, generated from the entire contract shall be either when 15 Tonnes of C&D waste has been generated or such C&D waste has been stored for 15 days (irrespective of quantity), of the two whichever is earlier.

54.3.8 Proper record keeping has to be maintained for all disposed C&D waste. The contractor shall submit the C&D waste record through Monthly Environment Report.

**54.4 Hazardous Waste Management**

54.4.1 Generally, the hazardous waste from construction site includes used oil, grease, oil filters etc. A comprehensive list of hazardous waste is found in Hazardous waste management and handling rules 2016. If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous and Other Wastes (Management & Transboundary

Movement) Rules, 2016 shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

- 54.4.2 Chemicals classified as hazardous chemicals under “Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendments of Environment (Protection) Act, 1986 shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.
- 54.4.3 The contractor shall identify the nature and quantity of hazardous waste generated as a result of his activities. The contractor shall obtain authorization for handling, storage of hazardous waste from the concerned pollution control board/committee. The contractor shall file annual return in prescribed format with the concerned pollution control board/ committee and forward a copy of receipt to employer.
- 54.4.4 The contractor shall provide and maintain a separate hazardous waste storage area for a) flammable, ignitable, reactive and b) Non- compatible wastes with suitable opening, Flame proof Electrical fittings should be at 15 m distance between the storage sheds. The storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills.
- 54.4.5 The storage area for Hazardous waste shall:
- a) Be clearly labelled and used solely for the storage of chemical waste;
  - b) Be enclosed on at least three sides;
  - c) Have an impermeable floor and bunding of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the hazardous waste stored in that area, whichever is greater;
  - d) Have adequate ventilation;
  - e) Be covered to prevent rainfall entering and
  - f) Be arranged so that incompatible materials are adequately separated
- 54.4.6 Outside the storage area, the contractor shall place a ‘display board’, which will display quantity and nature of hazardous waste, on date. Hazardous Waste needs to be stored in a secure place.
- 54.4.7 It shall be the responsibility of the contractor to ensure that hazardous wastes are stored, based on the composition, in a manner suitable for handling, storage and transport. The labelling and packaging is required to be easily visible and be able to withstand physical conditions and climatic factors
- 54.4.8 Lubricants including oil and grease generated from operation of the TBM/other Machaneries/vehicles should be disposed off as a hazardous waste.
- 54.4.9 Drip pans of suitable size and numbers shall be used to collect oil leakages and spills. The area shall be cleaned after completion of maintenance /repair and generated waste disposed off in approved manner.
- 54.4.10 The contractor shall follow the manifest and approach only Authorised Recyclers of Hazardous Waste for disposal of Hazardous Waste, under intimation to the Employer.
- 54.5 Chemical Waste**
- 54.5.1 The contractor should ascertain if some paints and solvents are classified as chemical waste and, if used on site, shall be subject to the stringent requirements of the Waste Disposal of Chemical Waste. Empty paint cans shall be recycled or collected as waste.
- 54.5.2 Any dry paint waste should be swept up (broomed / vacuumed) and collected in containers for disposal.
- 54.5.3 Containers used for the storage of chemical waste shall:

- a) Be suitable for the substances they are holding, resistant to corrosion, maintained in good condition, and securely closed.

- b) Be of adequate capacity and
- c) Display a label in English and Hindi/Marathi as to the contents, quantity and safe method of disposal in accordance with instructions contained in Material Safety Data Sheet (MSDS).

54.5.4 The storage area for chemical waste shall:

- a) Be clearly labelled and used solely for the storage of chemical waste;
- b) Be enclosed on at least three sides;
- c) Have an impermeable floor and bunding of capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is greater;
- d) Have adequate ventilation;
- e) Be covered to prevent rainfall entering and
- f) Be arranged so that incompatible materials are adequately separated.

54.5.5 Disposal of chemical waste shall be through a licensed waste collector duly authorized by the MoEF & CC or State Pollution Control Board as the case may be under intimation to the Employer.

54.5.6 No lubricants, oils, solvents or paint products shall be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site.

54.5.7 In sum, even though the exact quantities of chemical waste that will be generated per contract are expected to be small, still, because of the potential environmental and health & safety hazard that these chemicals pose, they must be handled, stored and disposed of appropriately, in accordance with the law.

#### **54.6 Metal Scrap**

54.6.1 Steel and other metals should be recovered from the construction waste and recycled as far as practical.

54.6.2 The contractor shall have a separate scrap yard with hard surface

54.6.3 Disposal of scrap shall be through a licensed waste collector/recycler under intimation to the Employer.

#### **54.7 Polymer Slurry**

54.7.1 Polymer slurries or other grouts used in diaphragm wall construction, piling and other concrete works should be collected in a separate slurry collection system.

54.7.2 If reuse is not practicable then it should be disposed off at nearest landfill site after obtaining permission from agency owning the landfill and under the conditions imposed by the agency concerned, or to a different disposal location as advised by the Employer.

54.7.3 Some Polymer slurry shall be used in diaphragm wall, bore-pile or to support the cutting face during maintenance of the TBM. This should be reconditioned and reused wherever practicable.

54.8.3 However, it may not be possible for re-use when it is extracted along with rock waste when tunnelling resumes following each intervention period. In this case the polymer will be mixed with rock and drained as usual before sending to the final disposal site.

### **55.0 ENVIRONMENTAL MONITORING**

#### **55.1 GENERAL**

55.1.1 The Contractor shall carry out the monitoring of Air, DG stack, Noise, Vibration and ground water to assess the impact on environment during construction.

55.1.2 In addition, soil monitoring shall be carried out at underground station till no excavation is required. Representative sensitive receivers in the vicinity of the works shall be monitored for

noise and air quality impacts. Vibration monitoring shall be carried out as and when directed by the employer.

- 55.1.3 The Environmental monitoring shall be carried out by a MoEF recognised agency/lab with the prior approval of Maha Metro Environment Department. This approval can be withdrawn at any time if the quality of output of the laboratory/agency is found not satisfactory by Maha Metro Environment Department.
- 55.1.4 The contractor shall release the payment due to the monitoring agency within 2 months of the submission of bills failing which the Employer may deduct the payment from RA bills and directly pay to the engaged monitoring agency.
- 55.1.5 The contractor shall submit the method statement for the environmental monitoring with the prior approval of Maha Metro Environment Department.

## **55.2 Air Monitoring**

- 55.2.1 For carrying out air monitoring the contractor shall appoint agency duly approved by Maha Metro Environment department with intimation to the employer. The contractor shall provide 220V AC power point, safety and security of monitoring equipment and suitable access at each monitoring point. Monitoring stations should be free from local obstructions or sheltering.
- 55.2.2 The monitoring shall be carried out till handing over of the site to the employer or as approved by Maha Metro Environment Department.
- 55.2.3 Ambient Air Quality Standards have been notified by the CPCB vide Gazette Notification dated 16th November 2009 and its amendments. These standards have to be referred by the Contractor for Limit Levels of PM10 and PM2.5 and other Parameters in ambient air which may be followed in estimating the pollution level caused by Contractor's activities.
- 55.2.4 Contractor will undertake baseline monitoring to establish background levels. Action Level of the Contractor shall be based on the results of baseline monitoring programme.
- 55.2.5 Where the Employer determines that the recorded PM10 & PM2.5 levels are significantly greater than the Limit levels, the Employer may direct the Contractor to take effective remedial measures including, but not limited to, reviewing dust sources and modifying working procedures.
- 55.2.6 Where the recorded baseline levels exceed the ambient air quality standards, then at such locations the limit level is the recorded baseline. Contractor shall take all effective remedial measures to contain the levels to their baseline value as a result of his activities. The action level may be varied by and at the sole discretion of the Maha Metro.
- 55.2.7 The Contractor should inform the Maha Metro of all steps taken to investigate cause of exceedance and immediate action taken to avoid further exceedance through written reports and proposals for action.
- 55.2.8 The contractor shall ensure calibration of monitoring instruments and their respective calibrators shall be carried out in accordance with the manufacturer's requirement to ensure they perform to the same level of accuracy as stated in the manufacturer's specifications.
- 55.2.9 The Contractor shall keep records of air quality monitoring (including location, date, time) and shall be available for review by the Employer. The Contractor shall submit a copy of monitoring results through the Monthly Environment Report (MER) to the Employer.
- 55.2.10 PM10 monitoring shall be done using Respirable Dust Sampler (RDS) and for PM2.5 either cyclone or impactor shall be used. Monitoring shall be done as per CPCB methodology
- 55.2.11 All the parameters as mentioned in Table 1.5 shall be monitored at following locations:
  - a) Depot, Batching Plant and Casting Yard



- b) Elevated Stretch (Station and Viaduct)
- c) Underground Station (at ground level)
- d) Tunnel (only PM 2.5) Additionally, the contractor shall also carry out monitoring of PM2.5 at those locations where PM10 monitoring is carried out.

55.2.12 Following guidelines to be followed while monitoring, the RDS sampler to be placed such that:

- a) The entry point of air should be at  $2.5 \pm 0.5$  m above the ground.
- b) The sampler to be placed near to the receptor at least 2.5-3.0 m away from barricades/obstruction.
- c) Ensure flow rate of  $1.15 \text{ m}^3/\text{m}$ .
- d) The location will be finalized by environmental engineer at site in consultation with Maha Metro Environment deptt.
- e) Elevated stretch: PM10 & 2.5 and other parameters monitoring to be carried out at every elevated station at a height of  $2.5 \pm 0.5$  m. In the viaduct, monitoring to be performed at one location per 1 km in consultation with Maha Metro Environment department.
- f) Underground Station: PM10 & 2.5 and other parameters monitoring to be conducted at  $2.5 \pm 0.5$  m above the ground. The specifications to be as per elevated stations

### 55.3 Noise Monitoring

- 55.3.1 Noise monitoring shall be carried out at ambient air monitoring locations in 15 days till site is handed over to the employer or The monitoring location shall be near to boundary of construction site and or as directed by the employer. Construction noise measurements shall coincide with daytime and night time periods of maximum noise generating construction activities.
- 55.3.2 Contractor will undertake baseline monitoring to establish background levels. Action Level of the Contractor shall be based on the results of baseline monitoring programme.
- 55.3.3 The Contractor shall submit a copy of monitoring results. The results should represent a comparison of data in form of bar charts for evaluation of trends and comparison with noise emission standards.
- 55.3.4 Where the Employer determines that the recorded Noise level is significantly greater than the acceptable levels, the Employer may direct the Contractor to take effective remedial measures including, but not limited to, reviewing noise sources and modifying working procedures.
- 55.3.5 Monitoring shall be carried out for day and night separately.
- 55.3.6 The noise monitoring parameters are  $L_{\text{max}}$ ,  $L_{\text{min}}$ ,  $L_{\text{eq}}$ ,  $L_{90}$ ,  $L_{50}$  &  $L_{10}$ . All the parameters will be reported separately for day time and night time.
- 55.3.7 The contractor shall ensure calibration of noise monitoring instrument and its calibration shall be carried out in accordance with the manufacturer's requirement to ensure it perform to the same level of accuracy as stated in the manufacturer's specifications.
- 55.3.8 Type I/II integrating sound level meter with free -field microphone and tripod stand of 1 to 1.5 m height shall be used for noise monitoring. The microphone of the instrument shall be near the receptor.
- 55.3.9 The minimum requirements to the specifications of sound level meter are given in BIS: 9779-1981 and its latest amendment. Measurement frequency of 31.5 Hz to 8000 Hz. Noise measurements shall be reported in dB(A). Sound Level Meter should be Type-I/II with A, C & Z weighing and measured sound values should also be suitably presented for quick comparison and interpretation.

### 55.4 Vibration

- 55.4.1 Steady State Vibration on any pre-identified site or building shall be measured on any foundation or intermediate storey of any building, as directed by the employer or his representative.

55.4.2 Vibration measurements shall be made preferably in velocity mode (PPV) or acceleration (dBv / vdB) in X-Y-Z directions with the help of a measurement system calibrated in an NABL accredited laboratory/equivalent. The transducer used for measurements should be firmly fixed on to the measurement surface as per internationally accepted measurement practices. Precautions should be taken to ensure that the mounting methods do not affect the accuracy of measurement results. The accelerometer shall be fixed firmly to the vibrating surface with the help of special wax or through magnetic mounts.

55.4.3 The measured vibration values should be accurate within an overall measurement uncertainty of  $\pm 10\%$  over the frequency range 1Hz – 100 Hz.

55.4.4 The data should be presented in suitable single number quantities like VdB or PPV values as per current international practices so that the final values are comparable directly with the accepted norms for structural integrity, human comfort etc.

## 55.5 Ground Water

55.5.1 The employer may require the contractor to monitor surface/ ground water/drinking water, for which requirements of IS 10500:2012 or its latest amendments shall be followed for sampling and testing (physical and chemical parameters).

55.5.2 Frequency of such monitoring at Stations, viaduct, batching plants, casting yard, Labour camps shall be once in 3 months.

## 55.6 Soil

55.6.1 The contractor shall carry out soil testing at all elevated, underground stations and working Sites. The frequency of testing shall be once in 3 months. The parameters of monitoring shall be Lead (Pb), Cadmium (Cd), Chromium (Cr6+), Mercury (Hg), Arsenic (As) and cyanide (CN). The sample collection, testing shall be as per relevant APHA standard.

## 55.7 Environmental Monitoring Programme

55.7.1 The various parameters, monitoring locations and Frequency of monitoring are presented in Table below:

**Table 1.5: Summary of contractor's Environmental Monitoring Programme**

Parameters	Locations	Frequency
<b>Air</b>		
PM2.5, PM10, Sox, Nox, Co, Pb, Ni, As, O <sub>3</sub> ( $\mu\text{m}^3$ )	Station, Viaduct, depot, Batching plant, Casting yard Inside the Tunnel and in underground stations	Once in 15 days for 24hrs
PM10 Sox, Nox, Co, Pb, ( $\mu\text{m}^3$ )	DG Sets	Once in 1 month
<b>Noise</b>		
Day Time (6 AM – 10PM) Lmax, Lmin, Leq, L10, L90, L50  Night Time (10PM – 6AM) Lmax, Lmin, Leq, L10, L90, L50	Station, Viaduct, depot, Batching plant, Casting yard etc.	Once a 15 days for 24hrs (Separately for day time and night time)
<b>Ground Water/Drinking water</b>		

Parameters	Locations	Frequency
Colour, odour, Taste, Turbidity, pH, toatad Hardness, Calcium, Ammonia, Residual Free Chlorine, Fluoride, Total Dissolved Solids, Magnesium (Mg), Copper (Cu), Sulphide (H <sub>2</sub> S), Sodium, Potassium, Chloride, Nitrogen, Phosphorus, Organic Matter, Heavy Metals (Mercury, Cadmium, Arsenic, Cyanide, Lead, Chromium), Oil & Grease, Total Coliform, E.Coli, etc.	Station, Viaduct, Depot, Batching Plant and Casting Yard, Labour Camp	Once in 3 months
<b>Soil</b>		
pH, Conductivity, Boron, Nitrogen, Calcium (Ca), Sodium (Na), Potassium (K), Zinc (Zn), Organic carbon, Magnesium (Mg), Phosphorus, iron (Fe), Lead (Pb), Cadmium (Cd), Chromium (Cr <sup>6+</sup> ), Mercury (Hg), Arsenic (As) and cyanide (CN).	At elevated & underground stations	Once in 3 months
<b>Vibration</b>		
Vibration in mm/s or VdB.	At elevated & underground stations	During complaints or as directed by employer.

## 56.0 ENVIRONMENTAL SANITATION

- 56.1 Environmental Sanitation refers to providing for a clean, hygienic, safe and aesthetically pleasing work area, as far as possible. It is also referred to as good housekeeping.
- 56.2 The Contractor shall constitute a special group of housekeeping personnel in charge of each work section. Contractor's Environment officer shall be responsible for Environmental sanitation/housekeeping at their respective site.
- 56.3 Housekeeping is the responsibility of all site personnel, and line management commitment shall be demonstrated by the continued efforts of supervising staff towards this activity.
- 56.4 General Housekeeping shall be the responsibility of site In-Charge and monitored by the housekeeping manager at all worksite, construction Depot, Batching Plant, Labour Camp, Stores, Offices and toilets / urinals. Towards this the contractor shall constitute a special group of housekeeping personnel. This group shall ensure daily cleaning at work sites and surrounding areas and maintain a register. Contractor's Environment officer shall be responsible for Environmental sanitation / housekeeping.
- 56.5 Each section of work site shall maintain the site reasonably clean, keep free from obstruction and properly store any construction equipment, tools, and materials. Any wreckage, rubbish shall be temporarily stored in wreckage and rubbish bins. These wreckage and rubbish bins shall be cleaned at frequent intervals. Special housekeeping group will ensure daily cleaning work at the site and its surrounding areas.
- 56.6 The Contractor's designated department will impart the necessary introduction/awareness and education to labours on housekeeping. This will be done through toolbox talks.
- 56.7 Every individual would be responsible for environmental sanitation in his area i.e.

- A. **At Work Site:** All workers should clean their workplace after completion of their job. Supervisor should ensure good environmental sanitation of their respective work area through their workers. Environment Managers shall ensure sanitation in their area through their supervisors. Contractor's designate department will monitor this activity through environment manager as well as site supervisor.
- B. **Labour Camp:** All workers should be responsible to maintain good sanitation and hygienic condition in their respective rooms/dormitories. The Contractor should ensure the availability of dustbins at required place and regular cleaning of rooms, kitchens, toilet blocks and dustbins. Safe disposal of all waste materials should also be ensured. Arrangement for regular fumigation should be made by the contractor.
- C. **At Store:** Proper access and stacking shall be ensured at the Stores. A list will display daily stock of materials. All work material should be stored in clearly marked containers or at designated storage area.
- D. **At Office:** Everyone is responsible to maintain sanitation of their work station. Disposal of waste materials (i.e. stationary, cigarette buds, tea bags etc.) must be in dustbin only.
- 56.8 Adequate Time shall be assigned to ensure that good housekeeping is maintained. This shall be carried out by team of housekeeping squad.
- 56.9 The contractor shall be responsible to provide segregated containers for disposal of debris at required places and regular cleaning of the same.
- 56.10 Full height fence, barriers, barricade etc. shall be erected around the site in order to prevent the surrounding area from excavated soil, rubbish etc, which may cause inconvenience to and endanger the public. The barricade especially those exposed to public shall be aesthetically maintained by regular cleaning and painting as directed by the employer. These shall be maintained in one line and level. Measures shall be adopted to ensure that seepage from site shall not go on road / public areas.
- 56.11 The structure dimension of the barricade, material and composition, its colour scheme, Maha Metro Logo and other details shall be in accordance with specification laid down in tender document.
- 56.12 All surplus earth and debris are removed/disposed off from the working areas to officially designated dumpsites. Trucks carrying sand, earth and any pulverized materials etc. in order to avoid dust or odour impact shall be covered while moving. The tyres of the trucks leaving the site shall be cleaned with water, wherever the possibility of spillage on carriageways meant for regular road traffic exists.
- 56.13 No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which may obstruct the traffic movement.
- 56.14 Roads shall be kept clear and material like: pipes, steel, sand boulders, concrete, chips and brick etc. shall not be allowed on the roads to obstruct free movement of road traffic.
- 56.15 Proper and safe stacking of material are of paramount importance at yards, stores and such locations where material would be unloaded for future use. The storage shall be well laid out with easy access and material stored/stacked in an orderly and safe manner.
- 56.16 Flammable chemicals / compressed gas cylinders shall be safely stored.
- 56.17 Unused/surplus cables, steel items and steel scrap lying scattered at different places within working areas shall be removed to identified locations.
- 56.18 All wooden scrap, empty wooden cable drums and other combustible packing material, shall be removed from workplace to identified locations.

56.19 Empty cement bags and other packaging material shall be properly stacked and removed.

56.20 The contractor shall ensure that all his sub-contractors maintain the site reasonably clean through provision related to housekeeping.

56.21 Debris shall be handled and disposed off in such a manner that it does not create any hazards to the site personnel. Debris shall not be accumulated to form a hazard and should be kept sufficiently moist to bring down the dust level within permissible limit.

56.22 Debris or other material shall not be thrown inside or outside the site premises from any height. The debris or waste material shall be disposed off at regular interval and as soon as the work has been completed.

#### **57.0 AVOIDANCE OF NUISANCE**

57.1 The Contractor shall take all precautions to avoid any nuisance arising from his operations. This shall be accomplished, wherever possible by suppression of nuisance at source rather than abatement of the nuisance once generated.

57.2 Following site clearing and before construction, the Contractor shall remove all trash, debris and other weeds.

57.3 The Contractor shall ensure that the workplace is free of trash, garbage, debris and weeds.

57.4 Light used for construction can illuminate adjacent areas in undesired ways. Such lighting and glare shall be prevented from striking adjacent areas, where feasible, through directional shielding.

57.5 The other measures include but not limited to:

- a) Careful positioning of construction equipment.
- b) Eliminating the possibility of stockpiles of material from being visible to public.
- c) Strategically placing high visibility site markings at construction sites indicating facilities, offices and stores.
- d) Adequate and properly managed parking of vehicles at construction depots and batching plants.

57.6 Measures shall be taken to prevent Mosquito breeding at site. The measures to be taken shall include, but not limited to, the following:

- a) Construction run-off shall not be allowed to stagnate at work sites specially at construction depots and batching plant locations, by executing an efficient drainage system and / or levelling of low-lying areas.
- b) Empty cans, oil drums, packing and other receptacles which may retain water shall be deposited at a central collection point and shall be removed from site regularly.
- c) Still waters shall be treated at least once every week with eco-friendly chemical in order to prevent mosquito breeding; contractor's equipment and other items on the site, which may retain water, shall be stored, covered or treated in such a manner that water could not be retained.
- d) All coolers should be scrubbed and cleaned once a week and mopped, dry before refilling and if cannot be emptied, put one tablespoon of temephos / petrol or Authority approved chemicals.
- e) Collection of stagnant water should not be allowed inside or around construction sites / office premises/ project sites / parking area/ labour camps and if the same does not take place a little quantity of kerosene/ petrol/ diesel or chemical approved by local authorities may be put in such stagnant wastewater collection.
- f) Ensure that over head and other water tanks / containers are kept closed properly with lid and overflow pipe/ air vent are covered with wire mesh.
- g) Unused/ broken bottles, plastic cups, pots and tyres etc that can hold water should not be left in open in all contractor's premises.
- h) Provision of access to roof tops and over head tanks in all contractor's offices to facilitate checking of mosquito breeding.

**58.0 ARCHAEOLOGICAL AND HISTORICAL PRESERVATION**

- 58.1 The contractor shall seek to accommodate archaeological and historical preservation concerns that may arise due to the construction of the project especially in close vicinity of such areas where such monuments may be located.
- 58.2 The contractor shall consult the Archaeological Survey of India (ASI) and other parties, on the advice of the Employer, to identify and assess construction effects and seek ways to avoid, minimize or mitigate adverse effects on such monuments.
- 58.3 Adverse effects may include reasonably foreseeable effects caused by the construction that may occur later in time, be farther removed in distance or those that alter, howsoever temporarily, the significance of the structure.
- 58.4 Where the alignment, runs within the prohibited/regulated zone of the monuments, Employer will apply for No Objection Certificate (NOC) from Director of Archaeology Archaeological Survey of India as per provision of National Monuments and Archaeological Sites and Remains (Amendment & Validation Act 2010).

**59.0 LANDSCAPE AND GREENERY**

- 59.1 As far as is reasonably practicable, the Contractor shall maintain ecological balance by preservation of trees and defacing of natural landscape.
- 59.2 The Contractor shall, so conduct his construction operations, as to prevent any avoidable destruction, scarring or defacing of natural surroundings in the vicinity of work.
- 59.3 Where destruction, scarring, damage or defacing may occur as a result of operations relating to Permanent or Temporary works, the same shall be repaired, replanted or otherwise corrected at Contractor's expense. All work areas shall be smoothened and graded in a manner to conform to natural appearance of the landscape as directed by the Employer.
- 59.4 Contractor shall clear the construction site of all scarp, dust, C&D waste and restore the site as per initial condition at the end of contract.

**60.0 ENERGY MANAGEMENT**

- 60.1 The Contractor shall use and maintain equipment so as to conserve energy and shall be able to produce demonstrable evidence of the same upon Employer's request.
- 60.2 Measures to conserve energy include but not limited to the following:
1. Use of energy efficient motors and pumps
  2. Use of energy efficient lighting, which uses energy efficient luminaries
  3. Adequate and uniform illumination level at construction sites suitable for the task
  4. Proper size and length of cables and wires to match the rating of equipment
  5. Use of energy efficient air conditioners
- 60.3 The Contractor shall design site offices maximum daylight and minimum heat gain. The rooms shall be well insulated to enhance the efficiency of air conditioners and the use of solar films on windows may be used where feasible.

**61.0 ENVIRONMENTAL SITE INSPECTION**

- 61.1 Site inspection shall be undertaken by the Contractor's Project Manager along with Environmental team to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control measures are properly followed and implemented. The frequency of site inspection shall be at least once a week.
- 61.2 The Contractor shall, submit to the Employer a contract specific comprehensive Environment Inspection checklist as requirement of Site Environmental Plan.

- 61.3 The area of inspection shall not be limited to environmental compliance within the site but areas outside the site which are likely to be affected, directly or indirectly by activities at site.
- 61.4 Results of inspection shall be discussed with Employer and his recommendations on better environmental protection shall be notified to the Contractor for taking immediate action and rapid resolution of identified non-compliance.
- 61.5 If any significant environmental problems are identified or if there is an environmental complaint towards any activity performed by contractor, shall be investigated by the Engineer along with the contractor and report on the same shall be submitted to the employer.
- 61.6 In addition, the Environment Department of Maha-Metro shall conduct surveillance audit of construction sites, in case of non compliance/violation of environmental conditions, penalties shall be levied in writing.
- 61.7 The results of monthly environmental inspection shall be discussed in monthly SHE committee meeting.
- 61.8 Reporting under the Environmental Management plan will contain the adopted mitigation measures for each potential activity and results of monitoring and inspection programmes.
- 61.9 In Site Environmental Plan, the Contractor shall prepare and submit monthly Environmental Management Reports in accordance with Employer's Requirements.
- 61.10 The Monthly Environment Management reports shall continue to be submitted till entire duration of contract and its extension.

#### **62.0 IGBC GREEN MRTS RATING REQUIREMENTS**

- 62.1 The Contractor shall, submit all the required documents/certificates/photographs to the Employer required for IGBC Green MRTS Rating which is broadly classified under following categories:
- A. Site Selection and Planning
  - B. Water Efficiency
  - C. Energy Efficiency
  - D. Material Conservation
  - E. Indoor Environment and Comfort
- 62.2 An indicative list of documents required for IGBC green MRTS certification has been provided in the general instruction Maha-Metro/SHE/GI/13

## **PART - V: PENALTY AND AWARDS**

### **63.0 PENALTIES TO BE CHARGED/RECOVERED FROM THE CONTRACTOR**

63.1 Maha-Metro is committed to provide and maintain Occupational Safety & Health in its all-project work activities, and intends to promote its image as a Safety Conscious Organisation. The unsafe conditions/acts at work place may cause accidents with serious injuries or fatalities to workmen and even to public, which will damage the reputation of Maha-Metro and hamper the project. Most of the accidents are avoidable and caused preliminarily due to Contractors' negligence. Hence Maha-Metro shall recover the cost of damages from the Contractors for every reportable incident (fatality / injury).

63.2 The work of metro construction is mostly executed on the right-of-way (movement of civil traffic) and densely populated business/residential areas. These work sites are more sensitive being in contact with public and may lead to serious accidents/damages. Any unsafe act / unsafe condition when observed by public/critics, attracts media adversely and further tarnishing on Maha-Metro's reputation. If such unsafe practices continue, and if not checked, and not penalised, may lead to serious irreversible damages/losses to the organisation. For the strict promotion of Occupational Safety & Health at the site of work and to avoid any safety violation with increased Safety Consciousness. Maha-Metro is empowered to levy penalties on any Safety violation.

63.4 The following table indicates the Safety, Health violation (unsafe act / unsafe condition) and charges/penalties to be recovered from contractors.

SN	Topic	Unsafe Act/Unsafe condition	Range of Levels	Deductible Amount
1	SHE Policy & Plan	<b>i) SHE policy.</b>	L1→L2	L1- Rs 5,000 per single violation, compounded to a maximum of Rs 25,000 at any single instance.
		a) non-compliance of clause 4.1		L2- Rs 10,000 per single violation, compounded to a maximum of Rs 50,000 at any single instance.
		<b>ii) SHE plan</b>	L1→L2	L1- Rs 50,000 per single violation, compounded to a maximum of Rs 1,00,000 at any single instance.  L2- Rs 1,00,000 per single violation, compounded to a maximum of Rs 2,00,000 at any single instance.
		a) Not as per Employers' content and coverage (Clause 4.3,4.6)		
		b) Delay in submission (Clause 4.3, 4.5)		
		c) Not updated as per Employer's instruction as per Clause 4.8		
2	SHE Organisation	d) Copies not provided to all required supervisors/engineers	L1→L2	L1- Rs 50,000 per month for first month and Rs 1,00,000 for subsequent months. L2- Rs 1,50,000 per month for first month and Rs 3,00,000 for subsequent months.
		Not complying to the minimum manpower requirements as mentioned in General Instruction Maha-Metro/SHE/GI/001(Clause 6.1.1)		
		Not filling up the vacancies created due to SHE personnel leaving the Contractor within 14 days. (Clause 6.7.2)		L1- Rs 50,000 for first month and Rs 1,00,000 for subsequent months.  L2- Rs 1,50,000 for first month and Rs 3,00,000 for subsequent months.



		SHE organisation not provided with required Audiovisual and other equipments as per General Instruction.Maha-Metro /SHE/GI/09		L1- Rs 25000 for first violation and Rs 50000 for subsequent violations.
		Employing through outsourcing agencies and SHE personal are not in the payroll of the main Contractor. (Clause 6.5.1)		L2- Rs 75000 for first violation and Rs 150000 for subsequent violations.
		Disobedience / Improper conduct of any SHE personnel. (Clause 6.2)		
		Chief SHE Manager not reporting directly to CPM of Contractor. (Clause 6.6)		
3	SHE committee	Failed to formulate or conduct SHE Committee meeting for any month (Clause 7.4)	L1→L2	L1- Rs 50000 for the first violation and Rs 200000 for the subsequent violations.
		Contractor and Sub-contractor representatives not attending SHE Committee meetings (Clause 7.10)		L2- Rs 250000 for the first violation and Rs 500000 for the subsequent violations.
		Failed to conduct Site inspection before conducting SHE Committee meeting (Clause 7.2.1 (xi))		L1- Rs 5,000 to the contractor of the member who had not attended the meeting for first violation and Rs 25,000 for subsequent violations.
		Failed to send SHE Committee Meeting minutes or Agenda to Employer in time (Clause 7.8.1, 7.9.1)		L2- Rs 10,000 to the contractor of the member who had not attended the meeting for first violation and Rs 50,000 for subsequent violations.
		Non-adherence of Clause 7.7.1		
		Non-adherence of Clause 7.9		
4	ID card	Non-adherence of Clause 8.1, 8.2 and 8.3	L1→L2	L1- Rs 25,000 for first violation and Rs 50,000 for subsequent violations.
				L2- Rs 1,00,000 for first violation and Rs 2,00,000 for subsequent violations.
5	SHE Training	Not complying to the requirements as mentioned in conditions of contract on SHE and project SHE manual with regard to:		
		a) Induction training not given (Clause 8.1)	L1→L2	L1- Rs 50,000 for first violation on and Rs 1,00,000 for subsequent violations.
		b) Supervisor / engineer / manager training not conducted as per Clause 9.6		

		c) Refresher training as per Clause 9.7 and 9.11 not conducted		L2- Rs 1,00,000 for first violation on and Rs 2,00,000 for subsequent violations.
		d) Tool-box talk not conducted as per Clause 9.8		
		e) Skill development training not conducted as Clause 9.9		
		f) Daily Safety Oath not conducted as per Clause 9.1		
		g) Top management behaviour based SHE training conducted (Clause 9.4)		
6	SHE Inspection	i) Not complying to the requirements as mentioned in conditions of contract on SHE and project SHE manual as per Clause 10.0	L1→L2	L1- Rs 50000 for first violation on and Rs 100000 for subsequent violations.  L2- Rs 1,00,000 for first violation on and Rs 2,00,000 for subsequent violations.
		ii) Non-compliance of clause 10.3 & 10.4		
7	SHE audit	<b>Internal Audit: MARS</b>	L1→L2	
		i) Not conducted as per SHE Plan (Clause 11.2.1) ii) Report not sent to Employer (Clause 11.2.6) iii) Action not taken for any month (Clause 11.2.4)		L1- Rs 50,000 for first violation on and Rs 75,000 for subsequent violations.  L2- Rs 1,00,000 for first violation on and Rs 2,00,000 for subsequent violations.
		<b>External Audit</b>		
		i) Not conducted as per SHE Plan (Clause 11.4.3 and 11.5.2.2)		L1-Rs 1,00,000 for first violation and Rs 2,00,000 for subsequent violations.
		ii) Report not sent to Employer (Clause 11.4.7 and 11.5.2.8.1)		
		iii) Action not taken for any quarter (Clause 11.4.9.4 and 11.5.2.10.4)		L2-Rs 2,00,000 for first violation and Rs 4,00,000 for subsequent violations.
8	SHE Communication	Important days to be observed for SHE awareness as furnished by Employer not observed (Clause 12.2)	L1→L2	L1- Rs 10,000 for first violation and Rs 25,000 for subsequent violations.  L2- Rs 50,000 for first violation and Rs 1,00,000 for subsequent violations.
		Posters as furnished by Employer not printed and displayed (Clause 12.2)		L1- 50,000 per contract  L2- 1,00,000 per contract

9	SHE Submittals	Non compliance of Clause 13.1	L1→L2	L1- Rs 50,000 for first violation on and Rs 1,00,000 for subsequent violations.  L2- Rs 1,00,000 for first violation on and Rs 2,00,000 for subsequent violations.
		Non compliance of Clause 13.2		L1-Rs 25,000 for first violation and Rs 50,000 for subsequent violations.
		Non compliance of Clause 13.3		L2-Rs 1,00,000 for first violation and Rs 2,00,000 for subsequent violations.
10	Injury and Incidence reporting	Fatal accidents	L3	L3- Rs 5,00,000 penalty and enforcement of embargo for first fatality, and Rs 10,00,000 penalty and enforcement of embargo for every subsequent fatality.
		Injury accident	L2→L3	L2- Rs 75,000 for first grievously injured person and Rs 1,50,000 for every subsequent grievously injured person (Grievous Injury as defined by Workmen Compensation Act).  L3- Rs 2,00,000 for first grievously injured person and Rs 4,00,000 for every subsequent grievously injured person
		Abnormal delay in reporting accidents or wilful suppression of information about any accidents / dangerous occurrence as per Clause 14.1.4	L2→L3	L2-Rs 75,000 for first violation and Rs 1,50,000 for subsequent violations.  L3-Rs 2,00,000 for first violation and Rs 4,00,000 for subsequent violations.
		Non-compliance of the Clause 14.4 The contractor shall create a fund to cater, from which in any case of fatal accident or permanent disability, payments will be made to the aggrieved party over and above the statutory requirements.	L2→L3	L2- Rs 50,000 for first violation on and Rs 1,00,000 for subsequent violations.  L3- Rs 1,50,000 for first violation on and Rs 3,00,000 for subsequent violations.

		The contractor shall create a fund to cater, from which in any case of fatal accident or permanent disability, payments will be made to the aggrieved party over and above the statutory requirements.		
11	Emergency preparedness Plan	Non-compliance of the Clause 15.1, 15.2, 15.3, 15.4, 15.5 and 15.6	L2→L3	L2- Rs 1,00,000 for non-compliance of any of the clauses.  L3- Rs 2,00,000 for non-compliance of any of the clauses.
12	Housekeeping	Housekeeping maintenance register not properly maintained up to date (Clause 17.4) Surrounding areas of drinking water tanks / taps not hygienically cleaned / maintained (Clause 17.4) Office, stores, toilet / urinals not properly cleaned and maintained. (Clause 17.4) Required dustbins at appropriate places not provided / not cleaned. (Clause 17.6) Stairways, gangways, passageways blocked. (Clause 17.9) Lumber with protruding nails left as such (Clause 17.10) Openings unprotected (Clause 17.7) Excavated earth not removed within a reasonable time.(Clause 17.15) Truck carrying excavated earth not covered / tyres not cleaned. (Clause 17.11) Vehicles / equipments parked / placed on roads obstructing free flow of traffic (Clause 17.13) Unused surplus cables / steel scraps lying scattered (Clause 17.17) Wooden scraps, empty wooden cable drums lying scattered (Clause 17.18) Water stagnation leading to mosquito breeding (Clause 42.6.1)	L1→L2	L1- Rs 10,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.  L2- Rs 20,000 per single violation Compounded to a maximum of Rs 2,00,000 at any single instance.
13	Working at Height / Ladders and Scaffolds	Not using or anchoring Safety Belt (Clause 18.9) Not using Safety Net (Clause 18.18)	L2→L3	L1-Rs 10,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.

		Absence of life line or anchorage point to anchor safety belt (Clause 18.19)	L1→L2 L1→L2 L2→L3	L2-Rs 20,000 per single violation Compounded to a maximum of Rs 2,00,000 at any single instance.  L3-Rs 30,000 per single violation Compounded to a maximum of Rs 3,00,000 at any single instance.
		Non-compliance of Clause 18.17		
		Using Bamboo ladders (Clause 18.20)		
		Painting of ladders		
		Improper usage (less than 1m extension above landing point, not maintaining 1:4 ratio) (Clause 18.20)		
		Aluminium ladders without base rubber bush (Clause 18.20)		
		Usage of broken / weak ladders (Clause 18.20)		
		Usage of re-bar welded ladders (Clause 18.20)		
		Improper guardrail, toe board, barriers and other means of collective protection (Clause 18.16)		
		Improper working platform (Clause 18.17)		
		Working at unprotected fragile surface (Clause 18.9)		
		Working at unprotected edges (Clause 20.0)		
14	Lifting appliances and gear	Non availability of fitness certificate as per Clause 21.3	L2→L3	L2-Rs 50,000 per single violation Compounded to a maximum of Rs 2,00,000 at any single instance.  L3-Rs 1,00,000 per single violation Compounded to a maximum of Rs 5,00,000 at any single instance.
		Documents not displayed on the machine or not available with the operator as per Clause 21.4		
		Maximum Safe Working Load not written on the machine as per Clause 21.5		
		Non-compliance of Clause 21.6		
		Non-compliance of Clause 21.7		
		Automatic safe load indicator not provided or not in working condition as per Clause 21.8		
		Age of the operator less than 21 years or without any licence and non-compliance of other item as per Clause 21.9		
		Non-compliance of Clause 21.10		
		Non-compliance of any of the items mentioned regarding rigging requirements as per Clause 21.11		
		Failure to submit method statement in case of all critical lifting (Clause 21.3)		
		Person riding on crane. (Clause 23.4)		
		Creating more noise and smoke (Clause 43.1.1)		
		Absence of portable fire extinguisher in driver cabin (Clause 31.5)		
		Fail to guard hoist platform (Clause 24.0)		
		No fencing of hoist rope movement area (Clause 24.0)		

		Hoist platform not in the horizontal position (Clause 21.2)		
		Usage of first Generation of Hydra Clause 21.11.11 and 21.11.12		
15	Launching operation	Non-adherence of any of the provisions mentioned in Clause 22.2	L2→L3	L2-Rs 50,000 for first violation and Rs 1,00,000 for subsequent violations.  L3-Rs 1,50,000 for first violation and Rs 3,00,000 for subsequent violations.
16	Site Electrical safety	Non-compliance of Clause 26.1.1	L2→L3	L2-Rs 10,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.  L3-Rs 20,000 per single violation Compounded to a maximum of Rs 2,00,000 at any single instance
		Non-compliance of Clause 26.2.3, 26.2.4 & 26.2.5		
		Non-compliance of Clause 26.3.1		
		Non-compliance of Clause 26.7, 26.8 and 26.9.1		
		Non-compliance of Clause 26.10 and 26.13		
		Non-compliance of Clause 28.3.2		
		Exposed electric lines (fermentative damage) and circuits in the workplace. (Clause 26.5.1)		
		Inserting of wires directly into the socket		
		Improper grounding for the electrical appliances Clause 26.7.1)		
		Electrical cables running on the ground (clause 26.8.5 & 26.8.6)		
		Non-compliance Clause 27.0		
17	Hand tools and Power tools	Non-compliance of Clause 28.0	L2→L3	L2-Rs 10,000 per single violation Compounded to a maximum of Rs 50,000 at any single instance.  L3-Rs 20,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.
18	Gas Cutting	Wrong colour coding of cylinder.	L2→L3	L2-Rs 10,000 per single violation Compounded to a maximum of Rs 50,000 at any single instance.  L3-Rs 20,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.
		Cylinders not stored in upright position. (Clause 29.1) Flash back arrester, non-return valve and regulator not present or not in working condition. (Clause 29.3 & 29.4)		
		Fail to put cylinders in a cylinder trolley. (Clause 29.1)		

		Damaged hose and fail to use hose clamps (Clause 29.2)		
		Using domestic LPG cylinders (Clause 29.5)		
		Fail to store cylinder 6.6m away from fire prone materials (Clause 29.8)		
		Fire extinguisher not placed in the vicinity during operation (Clause 29.6)		
19	Welding	Voltmeter and Ammeter not working (Clause 29.9)	L2→L3	L2-Rs 10,000 per first violation and Rs 50,000 for subsequent violations.
		Non-availability of separate switch in the transformer (Clause 29.9)		L3-Rs 75,000 per first violation and Rs 1,50,000 for subsequent violations.
		Improper grounding and return path. (Clause 29.10)		
		Damaged and bare openings in the welding cable. (Clause 29.10)		
		Damaged holder (Clause 29.10)		
		Fire extinguisher not placed in the vicinity during operation (Clause 29.6)		
20	Fire precaution	Smoking and open flames in fire prone area (Clause 31.6)	L2→L3	L2-Rs 5,000 per single violation Compounded to a maximum of Rs 25,000 at any single instance.
		Using more than 24V portable electrical appliances in the fire prone area (Clause 34.2.3)		L3-Rs 10,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.
		Not proper ventilation in cylinder storage area. (Clause 29.8)		
		Absence of fire extinguishers (Clause 31.1)		
		Fire extinguishers not refilled once in a year. (Clause 31.2)		
		Fire extinguisher placed in a not easily accessible location		
21	Excavation, Tunnelling and confined space	Non-compliance of Clause 34.1.1	L2→L3	L2-Rs 10,000 per single violation Compounded to a maximum of Rs 50,000 at any single instance.
		Non-compliance of Clause 34.2.3		L3-Rs 20,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.
		Non-compliance of Clause 34.4		L2-Rs 10,000 per first violation and Rs 50,000 for subsequent violations.
				L3-Rs 75,000 per first violation and Rs 1,50,000 for subsequent violations.
22	Work permit system	Non-compliance of Clause 35.2	L2→L3	L2- Rs 50,000 per first violation and Rs 1,00,000 for subsequent violations.
		Non-compliance of Clause 21.11.9		L3- Rs 1,00,000 per first violation and Rs 2,00,000 for subsequent violations.
23	Traffic Management	Non-compliance of Clause 36.4.1	L2→L3	

		Non-compliance of Clause 36.8.3		L2-Rs 50,000 per first violation and Rs 1,00,000 for subsequent violations.
		Non-compliance of Clause 36.9.2		
		Non-compliance of Clause 36.9.3		
		Non-compliance of Clause 36.9.7		
		Non-compliance of Clause 36.9.8		
		<b>Barricades (Clause 36.9.4)</b>		
		Not Cleaned	L2	Rs 15,000 per single violation Compounded to a maximum of Rs 25,000 at any single instance
		Not in alignment		
		Not numbered		
		Not painted		
		Red ights /reflectros not working		
		Damages not repaired		
		Not secured properly		
		Barricade inspector not employed		
		Protruding parts / portions repaired		
		Barricades maintaining register not properly maintained up to date		
		<b>Contractor Vehicles (Clause 36.9.5 &amp; 36.9.6)</b>		
		i) Over loading of vehicles ii) Unfit drivers or operators iii) Unlicensed vehicles iv) Absence of traffic marshals v) Absence of reversing alarm vi) Absence of fog light (at winter) vii) Power / hand brakes not in working condition.	L2	Rs 15,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance
		<b>Splashing of Bentonite on roads / non-cleaning of tyres of dumpers and transit mixers (Clause 17.11 &amp; 17.14)</b>		
		i) Mishandling of bentonite like splashing of bentonite outside specified width of barricading. ii) Non-cleaning of tyres of dumpers and transit mixers before leaving the site and thereby creating a traffic safety hazard to road users.	L2	a) Rs 50,000 on first observation. b) Rs 1,00,000 on second observation c) Rs 2,00,000 on third and subsequent observations
24	Batching plant / Casting yard	Non-adherence of any of the provisions mentioned in Clause 38.0.	L2	Rs 10000 for single violation compounded to a maximum of Rs 1,00,000 at any single instant.
25	PPE (Personal Protective Equipment)	Not having (Clause 39.1)	L2→L3	L2-Rs 200 per single violation.
		Not wearing (or) using and kept it elsewhere (Clause 39.1)	L2→L3	L3-Rs 400 per single violation.
		Using damaged one (Clause 39.2)	L2→L3	



		Using wrong type (Clause 39.5)	L2→L3	L2-Rs 10,000 for first violation and Rs 40,000 for subsequent violations.  L3-Rs 75,000 for first violation and Rs 1,50,000 for subsequent violations.  L2-Rs 10,000 for first violation and Rs 40,000 for subsequent violations.  L3-Rs 75,000 for first violation and Rs 1,50,000 for subsequent violations.
		Using wrong colour helmet or helmet without logo (Clause 39.4.1)	L1→L2	
		Using for other operation (e.g. Using safety helmet for storing materials or carrying water from one place to other) (Clause 39.5)	L2→L3	
		Not conforming to BIS standard (Clause 39.2)	L2→L3	
		Non-compliance of Clause 39.6, 39.7 and 39.8	L2→L3	
26	Occupational Health	Fail to conduct Medical examination to workers (Clause 42.1)	L1→L2	L1-Rs 5,000 per single violation Compounded to a maximum of Rs 50,000 at any single instance.  L2-Rs 10,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.  L3-Rs 15,000 per single violation Compounded to a maximum of Rs 1,50,000 at any single instance.
Absence of ambulance van & room (Clause 42.3)	L2→L3			
Workers not having ID card (Clause 8.2)				
Absence of first-aid person in work site (Clause 42.4)				
Absence or inadequacy of first-aid box (Clause 42.4)	L1→L2			
Misuse of first-aid box (Clause 42.4)				
First-aid box not satisfy the minimum Indian standard. (Clause 42.4)				
Smoking inside the construction site (Clause 42.7.2)	L1→L2			
Drink and drive or work (Clause 42.7.1)				
Fumigation / insecticides not sprayed to prevent Mosquito breeding (Clause 42.6.3)				
Non-compliance of Clause 44.1 and 44.2				
27	Labour Welfare measures	Inadequate number of toilets (Clause 46.1.1)	L1→L2	L1-Rs 10,000 per single violation Compounded to a maximum of Rs 50,000 at any single instance.  L2-Rs 20,000 per single violation Compounded to a maximum of Rs 1,00,000 at any single instance.
Toilets not cleaned properly (Clause 46.1.3)				
Toilet placed more than 500m from the work site (Clause 46.1.3)				
Absence of water facilities for toilets and washing places (Clause 46.1.3)				
Accommodation not provided as per BOCWA (Clause 46.5.1) )				
Absence of drinking water (Clause 46.4)				
Excessive noise and vibration (Clause 43.0)				
Canteen not provided (Clause 46.2)				
Food stuff not served on no loss no profit basis (Clause 46.3)				

		Creche not provided (Clause 46.6)		
		Non adherence of Labour welfare provisions of BOCWA (Clause 3.3.1.2)		
		Fail to register establishment and display the registration certificate at workplace (Clause 3.3.1.2)		
		Absence of workers register and records (Clause 3.3.1.2)		
		Absence of muster roll and wages register (Clause 3.3.1.2)		
		Fail to display an abstract of BOCWA and BOCWR (Clause 3.3.1.2)		

63.5 Without limiting to the unsafe acts and or conditions mentioned above in Clause 63.4 the Employer shall have the right to deduct charges for any other unsafe act and or condition depending upon the gravity of the situation on a case-to-case basis. The charges shall be in comparison with that of the similar offence indicated in Clause 63.4.

63.6 Non-conformities detected during inspections carried out by the Engineer are subject to a process adapted to the severity of the situation. Non-conformities are divided into 4 categories as follows:

63.6.1 Notification of observation of minor non-conformities. The non-conformity results in a notification to the on-site Contractor's representative, followed-up by a signed notification of observation prepared by the Engineer. The multiplication of notifications of observation at the Worksite, or absence of corrective actions by the Contractor, can result in the severity of the non-conformity being raised to that of level 1.

63.6.2 **Level 1 non conformity:** non-conformities, that do not represent a serious immediate risk for health and environment. The non-conformity is the subject of a report addressed to the Contractor and which shall be resolved within five (5) days. The Contractor addresses to the Engineer a report explaining how the non-conformity has been corrected. Further to an inspection and a favourable evaluation of effectiveness of the corrective action, the Engineer signs a close-out report for the non-conformity. In all cases where a non-conformity of level 1 is not resolved within one (1) month, the severity of the non-conformity is raised to level 2.

63.6.3 **Level 2 non-conformities:** Applies to all non-conformities that have resulted in damage to health or the environment or which represent a high risk to health and the environment. The same procedure as for level 1 non-conformities is applied. Corrective action shall be taken by the Contractor within three (3) days. The Contractor addresses a report explaining the corrective actions implemented. All level 2 non-conformities which are not resolved within one (1) month, are raised to level 3.

63.6.4 **Level 3 non-conformities:** applies to all non-conformities that represent a risk with major consequences to health and the environment. The highest levels of the Contractor's and Engineer's hierarchies present in the Employer's country are informed immediately and the Contractor has twenty-four (24) hours to bring the situation under control. Clause 14.7 of the Particular Conditions of Contract (PC), a level 3 non-conformity results in the suspension of interim payments until the non-conformity has been resolved. If the situation requires, and in pursuance to Clause 8.8 of the PC, the Engineer can order the suspension of work until the resolution of the non-conformity.

63.7 **Environmental Penalties:** Following penalties shall be recovered from contractors while dealing the Environmental Protection aspects/Management measures.

SL. No.	Topic	Violation	Deductible Amount
1.	Contractor's Environment Organization	Not engaging Environmental personnel for the entire duration of contract and its extension	Rs. 2,00,000/- for first month and Rs. 4, 00,000/- for subsequent months

2.	ISO Certification	Not obtaining ISO 14001:2015 & ISO 45001:2018 certification within the stipulated time frame with the Maha-Metro approved agency	Rs. 1,00,000/- per single violation and Rs. 2,00,000 for subsequent violations.
3.	External Environmental Audit	Not carrying out External Environmental Audit with the Maha-Metro approved agency	Rs. 1,00,000/-for first violation and Rs. 2,00,000/- subsequent violation
4.	Environmental Training	Not carrying out Environmental Training with the Maha-Metro approved agency	Rs. 50,000/- for first violation and Rs. 1,00,000/- subsequent violation
5.	Legal Requirements	Noncompliance of statutory requirements (CTE,CTO,Factory Act,CGWA Permission etc.)	Rs. 2,00,000/-for first violation and Rs. 4,00,000/- subsequent violation or as per regulatory Authority.
6.	Environmental Sanitation	<ol style="list-style-type: none"> <li>1. Environment Sanitation maintenance register not properly maintained up to date</li> <li>2. Surrounding areas of drinking water tanks/ taps not hygienically cleaned / maintained</li> <li>3. Office, stores, toilet/ urinals not properly cleaned and maintained</li> <li>4. Required dustbins at appropriate places not provided / not cleaned</li> <li>5. Water stagnation leading to mosquito breeding</li> <li>6. Not practicing any other Environmental Sanitation measures mentioned in this document</li> </ol>	Rs. 50,000/- for violation of any single item compounded to a maximum of Rs. 1,00,000/- at any single instance
7.	Felling of Trees & Tree Preservation	Felling of trees without obtaining requisite permission from Maha Metro /Statutory Authority	Rs. 1,00,000/- on single violation for item a)
8.	Top Soil Preservation	Top soil preservation not practiced	Rs. 25,000/- on each violation/ per instance
9.	Containment of Air Pollution	<ol style="list-style-type: none"> <li>1. Wheel washing facility not provided at exit gates of casting yard, batching plant and underground station sites</li> <li>2. Soil, sand, aggregate, debris of any kind and all dust prone materials stored without proper tarpaulin coverage</li> <li>3. Sprinkling or mist-based dust suppression methods not practiced at site</li> <li>4. Casting yard and batching plant not provided with hard surface and access roads and internal circulation roads not maintained properly</li> <li>5. Not maintaining required DG Stack height as prescribed in the standard</li> <li>6. Conveyor belt used for carrying aggregate not covered</li> <li>7. Carrying out construction work without erecting proper barricades</li> <li>8. Storage facility for dust generating materials/debris not provided</li> <li>9. Storing material/debris/soil outside barricaded area</li> <li>10. Storing aggregates and sand in open area</li> </ol>	Rs. 50,000/- on single violation compounded to a maximum of Rs. 2,00,000/- at any single instance

		<ul style="list-style-type: none"> <li>11. Over speeding of construction vehicles</li> <li>12. Operating vehicles, machineries and other equipments without valid PUC</li> <li>13. Truck carrying Material/ muck/ soil/ C&amp;D waste (debris) not covered / tyre not cleaned/washed while leaving site</li> <li>14. Deposition of material/muck/soil on public streets</li> <li>15. Dumping sites not barricaded</li> <li>16. Toe dust along the barricade not cleaned regularly</li> <li>17. Not practicing any other Air Pollution &amp; dust control measures mentioned in this document</li> </ul>	
10.	Containment of Water Pollution and Conservation of Water	<ul style="list-style-type: none"> <li>1. Transit Mixer (TM) washing facility not provided at casting yard/batching plant</li> <li>2. Drainage system not maintained at casting yard or and batching plant</li> <li>3. Not providing treatment facility before discharge of muck slurry into drainage system</li> <li>4. Washout of construction or excavated materials directly diverted to drainage system</li> <li>5. Spillage or dumping of Bentonite slurry/Poly-mud slurry or other grouts onto public road or any other ecologically sensitive location</li> <li>6. Discharge water from the site without the approval of the Employer</li> <li>7. Discharge of de-watered water from underground construction work to drains without prior approval of the Employer</li> <li>8. Not practicing any other Water Pollution control measures mentioned in this document.</li> </ul>	Rs. 50,000/- for violation of any single item compounded to a maximum of Rs. 2,00,000/- at any single instance
11.	Containment of Noise	<ul style="list-style-type: none"> <li>1. Not providing noise barrier of required height near noise sensitive receptors such as residences, schools, hospitals and similar areas</li> <li>2. Not providing acoustic enclosure or acoustic treatment for DG sets for meeting the ambient noise standards</li> <li>3. Breaching allowable noise limits given in this document</li> <li>4. Not adhering to noise limits for DG sets</li> <li>5. Not providing PPE to workers against occupational noise</li> </ul>	Rs. 50,000/- for violation of any single item from a) to b) compounded to a maximum of Rs. 2,00,000/- at any single instance
12.	Containment of Waste	<ul style="list-style-type: none"> <li>1. Waste Management Plan not submitted along with Environment Plan</li> <li>2. Leakage of waste during handling, storage and transportation of waste causing pollution</li> </ul>	Rs. 50,000/- for violation of any single item from a) to n) compounded to a maximum of Rs. 2,00,000/- at any single instance

		<ol style="list-style-type: none"> <li>3. Material Safety Data Sheet for material/ chemicals/ substances used not provided</li> <li>4. Not following waste disposal mechanism in accordance with this document</li> <li>5. Discharging of Bentonite slurry/Poly- mud slurry or other grouts drainage directly in to drainage system</li> <li>6. Delay in disposal of waste items</li> <li>7. Burning of refuse at construction site</li> <li>8. Required number of colour coded dust bins not provided</li> <li>9. Not disposing C&amp;D waste by authorized means</li> <li>10. Disposal of C&amp;D waste along the river bed, natural drainage and wet land</li> <li>11. Separate hazardous waste storage area not provided</li> <li>12. Drip pans of suitable size not provided</li> <li>13. Not maintaining separate scrap yard with hard surface</li> <li>14. Not practicing any other waste management measures mentioned in this document.</li> </ol>	
13.	Environmental Monitoring	<ol style="list-style-type: none"> <li>1. Air monitoring not implemented as per requirement given in this document</li> <li>2. DG set stack monitoring is not implemented as per requirement given in this document</li> <li>3. Noise monitoring not implemented as per requirement given in this document</li> <li>4. Soil testing not implemented as per requirement given in this document</li> <li>5. Groundwater testing not implemented as per requirement given in this document</li> <li>6. Carrying out monitoring through un- approved laboratories</li> <li>7. Not keeping records of monitoring</li> <li>8. Not maintaining check on the quality of monitoring agency while carrying out monitoring work at site</li> <li>9. Not verifying the correctness of monitoring data submitted by monitoring lab</li> <li>10. Not ensuring calibration of air monitoring instruments used by monitoring agency</li> <li>11. Not ensuring calibration of noise monitoring instrument used by monitoring agency</li> </ol>	Rs. 50,000/- for violation of any single item compounded to a maximum of Rs. 2,00,000/- at any single instance
14.	Green Building Requirements	<ol style="list-style-type: none"> <li>1. Green Building measures not implemented as per requirement given in Green Mass Rapid Transit System (MRTS) Rating (latest revision).</li> </ol>	Rs. 1,00,000/- for violation of any single item compounded to a maximum of Rs. 2,00,000/- at any single instance.

		2. Non-Submission of required documents under Green Mass Rapid Transit System (MRTS) Rating. 3. Not practicing any other Green Building requirements mentioned in this document	
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63.8 Without limiting to the environmental management measures mentioned above in Clause 63.7 the Employer shall have the right to deduct charges for any other Environmental management noncompliance depending upon the gravity of the situation on a case-to-case basis. The charges shall be in comparison with that of the similar offence indicated in Clause 63.4.

#### **64.0 STOPPAGE OF WORK**

64.1 The Employer shall have the right to stop the work at his sole discretion, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments. In such cases, the Contractor shall be informed in writing about the nature of hazards and possible injury / accident.

64.2 The Contractor shall not proceed with the work until he has complied with each direction to the satisfaction of Employer.

64.3 The Contractor shall not be entitled for any damages / compensation for stoppage of work, due to safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and will not be the ground for waiver of levy of liquidated damages.

#### **65.0 OCCUPATIONAL HEALTH AND SAFETY AWARDS**

65.1 The following categories will be considered for awards as per the scheme in practice of Employer:

- (i) For every safe million-man hour working without any reportable incidents
- (ii) Zero fatality contracts
- (iii) 100% adherence to voluntary reporting of all accidents throughout the currency of contract
- (iv) Safest project team of the year.
- (v) Best SHE team of the year.
- (vi) Safest Contractor of the year.

#### **66.0 ENVIRONMENTAL AWARDS**

66.1 The following categories will be considered for awards as per the scheme in practice of Employer

- (i) Best Environmentally managed Underground contract
- (ii) Best Environmentally managed Elevated contract
- (iii) Best Environmentally managed Batching plant
- (iv) Best Environmentally managed Casting yard
- (v) Best Condition of Contract compliant contractor

66.2 The above categories may increase or decrease at the sole discretion of the employer.

**PART - VI: APPENDIX, FORMS AND GENERAL INSTRUCTION****MAHARASHTRA METRO RAIL CORPORATION LIMITED****Appendix No.1: MoU between Maha-Metro and the Contractor for safe execution of contract work**

This Memorandum of Understanding is made and executed by and between **Maharashtra Metro Rail Corporation Limited (Maha-Metro)**, a Company registered under the Companies Act 1956 and having its registered office at XXXX or their authorized representative(s), hereinafter referred to as “**EMPLOYER**” (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business yhs and assigns) of the one party

AND

M/s \_\_\_\_\_ having its registered office \_\_\_\_\_ hereinafter referred to as the “**CONTRACTOR**” (which expression shall wherever the context so requires or admits be deemed to mean and include its successors in business and assigns) of the other party

WITNESSETH THAT

WHEREAS the EMPLOYER gives highest importance to the occupational safety, health and environment during execution of work, seeks cooperation from the CONTRACTOR in this endeavour.

Thus, this Memorandum of Understanding is for promoting the safety, health and environment aspects required to be followed at workplace/site and will be applicable to any site job to be done by the CONTRACTOR

AND

WHEREAS the CONTRACTOR has read all the terms and conditions of the EMPLOYER and whereas the CONTRACTOR has studied the following documents:

- (i) Tender Documents, including Notice Inviting Tender, General Conditions, Special Conditions;
- (ii) Conditions of Contract on Safety, Health and Environment and Project Safety, Health, and Environment Manual;
- (iii) Building and Other Construction Workers (Regulations of Employment and Conditions of Service) Act 1996, Central Rules 1998 and subsequent Maharashtra BOCW Rules 2003, Building and Other Construction Workers Welfare Cess Act 1996 and Rules 1998 and notification [Central & State] Collection of cesses.
- (iv) Indian Electricity Act 2003 and Rules 1956;
- (v) Corresponding International / Bureau of Indian Standard Codes.

Including the amendments to any of the above rules and any other rules & regulations or procedures, circulars, notices & advices laid down by the EMPLOYER from time to time.

Now it is hereby AGREED AND DECLARED by and between the EMPLOYER and the CONTRACTOR as follows:

Clause - I                The CONTRACTOR shall abide by the terms and conditions stipulated in Condition of Contract on Safety, Health & Environment and Project Safety, Health & Environment Manual.

Clause - II              The CONTRACTOR shall undertake full responsibility for safe execution of job at work place/site and safety of his personnel and adjoining road users during work.

- Clause - III Without giving any prior notice, the EMPLOYER shall from time to time be entitled to add/or amend any or all terms and conditions with a view to improving safety and occupational health of personnel and safety of work, with immediate effect and the same shall be binding on the CONTRACTOR. The Contractor agrees to implement all such amendments, which shall be laid down by the EMPLOYER.
- Clause - IV Besides following the guidelines, safety rules and regulations, safety codes given in various safety procedures/documents mentioned above, the CONTRACTOR shall also prepare detailed method statement which includes job safety analysis wherever there are complicated and hazardous/high risk working involved and get it approved from Employer before execution of work.
- Clause - V Any negligence or violation in implementing any of the provision of the conditions of contract on Safety, Health & Environment and Maha-Metro project Safety, Health & Environment Manual shall be viewed seriously and the Contractor is liable to compensate the Employer for the loss of reputation. The cost of damage shall be fixed on case-to-case basis.

In witness thereof the Parties hereto by representatives duly authorised have executed this Memorandum of Understanding on \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_.

Signed on

Signed on

For and on behalf of Maha-Metro

For and on behalf of (Contractor)

\_\_\_\_\_

\_\_\_\_\_

Signature:

Signature:


Name:

Name:

Title:

Title:



	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>Appendix no.: 2: OHS and Welfare requirements as per BOCW Act 1996 and Rules 1998</b>	


(This list has been prepared in chronological order with primary importance to Section of Act and secondary importance to Rules)

- S - Refers relevant Sections in BOCWA  
R - Refers relevant Rules in BOCWR  
C - Refers relevant Chapter No. in BOCWR  
P - Refers to relevant rules in BOCWWCR 1998  
G - Refers to relevant rules in Maharashtra BOCWR 2003

SN	Items	Relevant Sections / Rules in BOCWA and BOCWR and MBOCWR 2003
1.	Registration of establishment	S – 7, R – 23 to 27
2.	Display of registration certification at workplace	R – 26 (5)
3.	Hours of work	S – 28 R – 234 to 237
4.	Register of overtime	S – 28; S – 29 R – 241(1) Form XXII
5.	Weekly rest and payment at rest	R – 235
6.	Night shift	R – 236
7.	Maintenance of workers registers and records	S – 30 R – 238
8.	Notice of commencement and completion	S – 46 R – 239
9.	Register of persons employed as building workers	R – 240
10.	Muster roll and wages register	R – 241(1) (a); Form XVI and XVII
11.	Payment of wages	R – 248
12.	Display of notice of wages regarding	R – 249
13.	Register of damage or loss	R – 241(1)(a); Form XIX, XX, XXI
14.	Issue of wages book	R – 241(2)(a); Form XXIII
15.	Service certificate for each workers	R – 241(2)(b); Form XXIV
16.	Display an abstract of BOCWA and BOCWR	R – 241(5)
17.	Deduction of welfare cess by the government agencies	P – 4(3)
18.	Annual return	R – 242; Form XXV
19.	Drinking water	S – 32
20.	Latrines and Urinals	S – 33 R – 243
21.	Accommodation	S – 34
22.	Creches	S – 35
23.	First-aid boxes	S – 36 R – 231 and Schedule III
24.	Canteens	S – 37 R – 244
25.	Food stuff and other items served in the canteens	R – 245
26.	Supply of tea and snacks in work place	R – 246
27.	Food charges on no loss no profit basis	R – 247
28.	BOCWR 2003 welfare Board Rules	
29.	Safety committee	S – 38 R – 208

SN	Items	Relevant Sections / Rules in BOCWA and BOCWR and MBOCWR 2003
30.	Safety officer	S – 38 R – 209 and Schedule VII
31.	Reporting of accidents and dangerous occurrences	S – 39 R – 210
32.	Procedure for inquiry in to the causes of accidents	R – 211
33.	Responsibility of employer	S - 44 R – 5
34.	Responsibility of Architects, Project engineer and Designers	R – 6
35.	Responsibility of workmen	R – 8
36.	Responsibility for payment of wages and compensation	S – 45
37.	Penalties and Procedures	S – 47; S – 55
38.	Excessive noise, vibration etc	R – 34
39.	Fire Protection	R – 35
40.	Emergency action plan	R – 36
41.	Fencing of motors	R – 37
42.	Lifting of carrying of excessive weight	R – 38
43.	Health, Safety and Environmental Policy	R – 39
44.	Dangerous and Harmful Environment	R – 40
45.	Overhead protection	R – 41
46.	Slipping, Tripping, Cutting, Drowning and Falling Hazards	R – 42
47.	Dust, Gases, Fumes, etc	R – 43
48.	Corrosive substance	R – 49
49.	Eye Protection	R – 45
50.	Head Protection and other protection apparel	R – 46; R – 54
51.	Electrical Hazards	R – 47
52.	Vehicular traffic	R – 48
53.	Stability of structure	R – 49
54.	Illumination	R – 50; R – 124
55.	Stacking of materials	R – 51
56.	Disposal of debris	R – 52
57.	Numbering and marking of floors	R – 53
58.	Lifting appliances and gears	C – VII; R – 55 to 81
59.	Runways and Ramps	C – VIII; R – 82 to 85
60.	Working on or adjacent to water	C – IX; R – 86 & 87
61.	Transport and earthmoving equipments	C – X; R – 88 to 95
62.	Concrete work	C – XI; R – 96 to 107
63.	Demolition	C – XII; R – 108 to 118
64.	Excavation and Tunnelling works	C – XIII; R – 119 to 168
65.	Ventilation	R – 153
66.	Construction, repair and maintenance of step roof	C – XIV; R – 169 to 171
67.	Ladders and Step ladders	C – XV; R – 172 to 174
68.	Catch platform and hoardings, chutes, safety belts and nets	C – XVI; R – 175 to 180
69.	Structural frame and formworks	C – XVII; R – 181 to 185
70.	Stacking and unstacking	C – XVIII; R – 186 & 187
71.	Scaffold	C – XIX; R – 188 to 205
72.	Cofferdams and Caissons	C – XX; R – 206 to 211
73.	Explosives	C – XXI; R – 212 & 213
74.	Piling	C – XXII; R – 214 to 222
75.	Medical Examination for building and other construction worker, Crane operator an Transport vehicle drivers	R – 81; R – 223(a)(iii) and Schedule XII


SN	Items	Relevant Sections / Rules in BOCWA and BOCWR and MBOCWR 2003
76.	Medical examination for occupational health hazards	R – 223(a)(iv)
77.	Charging of workers for Medical Examination	R – 223(b)
78.	Occupational health centres and medical officers	R – 225 and Schedule X & XI
79.	Ambulance van & room	R – 226 & 227 and Schedule IV & V
80.	Stretchers	R – 228
81.	Occupational health service for building workers	R – 229
82.	Medical examination for occupational health hazards	R – 223(a)(iv)
83.	Emergency care services and emergency treatment	R – 232
84.	Panel of experts and agencies	Central Rule 250
85.	Power of inspectors	Central rule 251 Maharashtra State Rules

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>Appendix no. : 3 Site Safety,Health and Environmental Plan</b>	

<b>Contract No</b>	
<b>Contractor Name</b>	
<b>Project Name</b>	

1.	<b>Project Highlights</b>  i) Title of the content ii) Contractor Number iii) Brief scope of work iv) Location map/ key plan v) Period of the project
2.	<b>SHE Policy</b>
3.	<b>Site Organisation Chart</b>  Chart indicating reporting of SHE personnel
4.	<b>Roles &amp; Responsibility</b>  Individual responsibility of the:  i) Project Manager ii) Construction Manager iii) Construction Supervisors iv) SHE Committee Members v) SHE In charge vi) Environmental Manager vii) Site Engineers viii) First Line Supervisors ix) Sub-contractors
5.	<b>SHE Committee</b>  i) Details - Chairman, Members, Secretary and Employer's representative ii) Procedures for effective conduct of meeting
6.	<b>SHE Training</b>
7.	<b>Subcontractor Evaluation, Selection and Control</b>
8.	<b>SHE Inspection</b>
9.	<b>SHE Audit</b>
10.	<b>Accident Investigation and Reporting Procedures</b>
11.	<b>Occupational Health Measures</b>
12.	<b>Labour Welfare Measures</b>
13.	<b>Risk assessment and mitigation procedures</b>

14.	<b>Safe Work Procedures</b> <ul style="list-style-type: none"> <li>i) Work at Height</li> <li>ii) Structural Steel Erection</li> <li>iii) Launching of segments</li> <li>iv) Floor, Wall Openings and Stairways</li> <li>v) Welding, Cutting and Bracing</li> <li>vi) Lifting appliances</li> <li>vii) Work Permit Systems</li> <li>viii) Electrical Equipments</li> <li>ix) Mechanical Equipments</li> <li>x) Excavation</li> <li>xi) Fire Prevention</li> <li>xii) Hazardous Chemicals and Solvents</li> <li>xiii) Ionising Radiation</li> <li>xiv) Lighting</li> <li>xv) Abrasive Blasting</li> </ul>
15.	<b>Work Permit System</b>
16.	<b>List of standard job specific PPEs to be used in the site</b>
17.	<b>Maintenance of Regime for construction Equipment and Machinery</b>
18.	<b>Traffic management</b>
19.	<b>Housekeeping</b>
20.	<b>Environmental Management</b>
21.	<b>Emergency Management</b>
22.	<b>Visitors and Security arrangement</b>


	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>Appendix No.4: Workplace Policy on HIV Prevention &amp; Control for Workmen</b>	

“Being mobile in and of itself is not a risk factor for HIV infection. It is the situations encountered and the behaviours possibly engaged in during mobility or migration that increase vulnerability and risk regarding HIV / AIDS.”

*UNAIDS, Technical update on ‘Population, Mobility and AIDS’, February 2001, p.5*

Maha-Metro recognizes HIV / AIDS as a developmental challenge and realizes the need to respond to it by implementing regular HIV / AIDS prevention programmes and creating a non-discriminatory work environment for HIV infected workmen engaged by contractors. For the purpose of making conscientious, sensitive and compassionate decision in addressing the realities of HIV / AIDS, Maha-Metro has established these guidelines based on ILO code of practice on HIV / AIDS.

- Creating awareness through professional agency using IEC (Information, Education and Communication) package specially designed for migrant workers.
- Institutional capacity building by training the project implementation team, Safety, Health & Environment (SHE) Managers, establishing linkages for efficient diagnosis and treatment of the affected workers, effective monitoring of implementation and documentation for further learning.
- Establishing peer educators by selecting them in consultation with Contractors and training them through professional agencies so that they become focal point for any information, education and awareness campaigns among the workmen throughout the contract period.
- Promotion of social marketing of condoms through State Aids Control Society

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/001: Minimum Manpower Requirements of SHE Org.</b>	

	1	2	3	4	5	6	7	8	9	10	11	12
Awarded Contract value (in Rs Cr.)	Chief SHE Manager	Senior SHE Manager	Junior SHE Manager	Safety Steward	Senior SHE (Electrical Engineer)	Junior SHE (Electrical Engineer)	Senior SHE (Fire) Manager	Occupational Health officer with Necessary Male Nursing Assistants	Senior Environmental Manager	Senior SHE (Traffic) Engineer	House Keeping Cum Barricade Maintenance Manager	Labour Welfare Officer
Up to 2	-	-	1	-	-	1	-	-	-	-	-	-
Up to 10	-	1	-	1	-	1	-	1 (PT)	1	1	Refer Note 4	1
Up to 25	1	-	1	-	1	-	1	1 (PT)	1	1		1
Up to 100	1	1	-	1	1	1	1	1 (FT)	1	1		1
Up to 200	1	2	2	2	1	2	1	2 (FT)	1	1		1 with support staff
More than 200	1	2	5	5	1	2	1	2 (FT)	1 with Env. Steward	1		

**Note 1:** The above deployment of SHE professionals can be varied as per the progress of work with approval of Engineer In-charge. Nothing extra shall be paid on this account.

**Note 2:** (PT) means Part-Time and (FT) means Full-time.

**Note 3:** Senior SHE (Traffic) Engineer Post and Barricade Manager (including the staff) Posts are applicable to contracts where the work has to be executed either below or over the right-of-way like Viaduct, Tunnel Contracts wherein erection and maintenance of barricades are paramount important.

**Note 4:** One Housekeeping cum Barricade Manager supported by **Minimum 02 (Two) Supervisors** and **10 (Ten) workmen**

**Note 5:** Minimum requirement of the SHE organisation given as above (SHE Condition of Tender Documents) with deployment schedule **shall prevail**, in case of any variation/conflict in provisions given in MAHA Metro SHE Manual or elsewhere.

**Deployment Schedule of SHE Professionals**

<b>SHE Professionals</b>	<b>DEPLOYMENT **</b>
Chief SHE Manager	Within 30 Days from the date of issuance of LOA
Senior SHE Manager	50% Within 30 Days from the date of issuance of LOA and balance 50 % Within 90 Days from the date of issuance of LOA
Junior SHE Manager	50% Within 30 Days from the date of issuance of LOA and balance 50 % Within 90 Days from the date of issuance of LOA
Safety Steward	50% Within 30 Days from the date of issuance of LOA and balance 50 % Within 90 Days from the date of issuance of LOA
Sr SHE (Ele Engineer)	Within 30 Days from the date of issuance of LOA
Jr SHE (Ele Engineer)	50% Within 30 Days from the date of issuance of LOA and balance 50 % Within 90 Days from the date of issuance of LOA
Sr SHE (Fire) Manager	Within 90 Days from the date of issuance of LOA
Occupational Health Officer	Within 60 Days from the date of issuance of LOA
Environmental Manager	Within 60 Days from the date of issuance of LOA
Sr SHE (Traffic) Engineer	Within 30 Days from the date of issuance of LOA.
House Keeping Cum Barricade Maintenance Manager with Team	Within 30 Days from the date of issuance of LOA.
Labour Welfare Officer	Within 60 Days from the date of issuance of LOA.
<b><u>Note:</u> ** Deployment to continue till completion of the project work.</b>	

**Note 1:** Minimum requirement of the SHE organisation given as above (SHE Condition of Tender Documents) with deployment schedule **shall prevail**, in case of any variation/conflict in provisions given in MAHA Metro SHE Manual or elsewhere.




**MAHARASHTRA METRO RAIL CORPORATION LIMITED**
**General Instruction: Maha-Metro/SHE/GI/002: Minimum Qualification and exp. for SHE Professionals**

SN	Designation	Qualification	Experience (in years)
1.	Chief SHE Manager	<p>The Chief SHE Manager shall have qualified in any of the following degree/diploma:</p> <ul style="list-style-type: none"> <li>i) Post Graduate Diploma in Industrial Safety &amp; Environmental Management (PGDISEM) from National Institute of Industrial Engineering, Mumbai</li> <li>ii) M.E. in Industrial Safety from NIT, Trichy, Tamil Nadu</li> <li>iii) M.E. in Industrial Safety from MepcoSchlenk Engineering College, Sivakasi, Tamil Nadu</li> <li>iv) B.E. in Fire and Safety Engg. From Cochin University of Science and Engg. Cochin, Kerala</li> <li>v) B.E. with advanced Safety Management Diploma from CLI / RLI Mumbai / Chennai / Kolkata and Kanpur.</li> <li>vi) B.E / B.Arch., with one-year <u>Full Time</u> advanced Safety diploma from NICMAR, Hyderabad.</li> <li>vii) B.E / B.Tech with any other equivalent State and Central Govt. recognized full time Degree / Diploma in Safety.</li> <li>viii) International qualifications like CSP (Certified Safety Professional), NEBOSH, MIOSH, MSISO etc.</li> </ul>	<p>12 years for Diploma holders and 10 years for Degree holders</p> <p>2 {for all category except (iv) and 5yrs for category (iv)}</p>
2.	Senior SHE Manager	<p>As stated in SN1 and in addition the following categories:</p> <ul style="list-style-type: none"> <li>i) B.Sc. (Physics/Chemistry/Maths) with one-year Full Time advanced Safety diploma from NICMAR, Hyderabad</li> <li>ii) B.Sc. / Diploma in Engg with advanced Safety Management Diploma from CLI / RLI / Mumbai / Chennai / Kolkata and Kanpur.</li> <li>iii) B.Sc. (Physics/Chemistry/Maths) with One-year Full Time diploma in Safety Engineering offered by West Bengal State Technical Education Departments and similar courses by other states.</li> <li>iv) Any Graduate or diploma holder with 7 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of employer on a case-to-case basis</li> </ul>	<p>05 years for Diploma holders and 03 years for Degree holders</p> <p>2 {for category (i), (ii) and (iii) only}</p>
3.	Senior Environment Manager	Govt. recognized B. Tech/ M.Sc./M.Tech. in Environmental Science/Engineering with experience in Metro Rail Project/Construction sector	5 Years
4.	Junior SHE Manager	<ul style="list-style-type: none"> <li>i) Degree in Science / Diploma in Engineering with Govt. recognized safety diplomas from Correspondence course of NICMAR, Annamalai University, National and State Productivity Councils, Other State Technical Education Boards etc.</li> <li>ii) Any Graduate or diploma holder with 5 years of work experience in full fledged SHE department of any Public Sector / Leading Private Sector / MNC / with prior approval of employer on a case-to-case basis</li> </ul>	2 (for category (i) only)


SN	Designation	Qualification	Experience (in years)
5.	Safety Steward	Any basic qualification with any SHE related certificate courses.	2
6.	Environment Steward	Any basic qualification with Environment Management certificate courses.	2
7.	Senior SHE (Electrical) Manager	Degree in Electrical Engineering + Govt. recognized Electrical Licence holder	2
9.	Junior SHE (Electrical) Manager	Diploma in Electrical Engineering + Govt. recognized Electrical Licence holder	1
10.	Senior SHE (Fire) Manager	i) B.E. (Fire) from National Fire Service College, Pune ii) B.E (Fire & Safety) from Cochin University iii) Graduate with any Govt. recognized diploma in Fire Safety with 5 years of experience	2 (for category (i) and (ii) only)
11.	Junior SHE (Fire) Manager	Any Diploma holder with any Govt. recognized diploma in Industrial Fire Safety.	1
12.	Occupational Health Officer	MBBS with Govt. recognized degree/diploma in Industrial/occupational health	1
13.	Senior SHE (Traffic) Engineer	Govt. recognized PG Degree / Degree / Diploma in Traffic/Transportation Engineering or Planning	1
14.	House Keeping Cum Barricade Manager	Any Diploma in Engineering	1
15.	Labour Welfare Officer	Any Degree with Govt. Recognized Degree / Diploma / P G Diploma in Labour Welfare related fields like Law, Personnel / Industrial Relations etc.	2

**Note 1:** In some extraordinary cases where the candidate had earlier worked in any metro projects in India, they can be considered for the following posts:

- Senior SHE Manager
- Junior SHE Manager
- Safety Steward

depending upon the qualification and number of years of experience on a case-to-case basis even if they do not possess the prescribed qualification as listed above.

**Note 2:** In all other cases other than listed under Note 1 irrespective their earlier experience with metro projects in India the candidates shall qualify as specified above.

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/003: Min. Requirements of SHE Monitoring and A.V. Equip.</b>	


- For the purpose of minimum requirements of Audio-visual and Other equipment the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Upto 25 Cr	A
Upto 100 Cr	B
Upto 250 Cr	C
More than 250 Cr	D

- Every contractor falling into the above groups shall provide the following minimum required audio-visual aids for conducting weekly review, monthly safety committee and other post review meeting of all fatal and major incidences effectively. These audio-visual equipments are a must for conducting periodical in-house safety presentations in the training programmes.
- In addition to the above portable hand-held digital sound level meter (SLM) and portable hand-held digital lux meter are also to be provided.

SN	SHE monitoring and Audio-Visual Equipment details	SHE monitoring and Audio-Visual equipment required for			
		Group A Contract	Group B Contract	Group C Contract	Group D Contract
1.	Portable hand-held Digital Sound Level Meter (SLM) Noise Monitoring deleted	1	1	1	1
2.	Portable hand-held Digital Lux Meter	1	1	1	1
3.	Laptop Computer with standard configuration including multimedia facilities	1	1	1	1
4.	Colour Printer	1	1	1	1
5.	Computer projector with screen	-	1	1	1
6.	Overhead projector	1			
7.	35mm Camera (For taking accident investigation photos in which case the images cannot be easily altered)	1	1	1	1
8.	Digital camera with flash of minimum 4 mega pixel and video facility	1	1	1	2
9.	Digital still camera with flash of minimum 4 mega pixel	1	2	4	6
10.	Portable loudspeaker (for tool-box talk and emergency purpose)	1	1	2	6
11.	Communication facility like mobile phone, walky-talky etc	For all supervisors and managers/engineers working in Safety, Health & Environment			
12.	Accident investigation Kit containing the following:	1	1	1	2
	a) Chalk piece for marking				
	b) Measuring tape for measuring Flexible tape – 2m length Metal Foot long scale and Metal tape – 30m				

SN	SHE monitoring and Audio-Visual Equipment details	SHE monitoring and Audio-Visual equipment required for			
		Group A Contract	Group B Contract	Group C Contract	Group D Contract
c)	Equipment tags				
d)	Multipurpose Flash light				
e)	Barrier tape of 20m length				
f)	Accident investigation Forms and checklists				
g)	Enough Paper for witness recording and other noting				
h)	Emergency Phone Numbers list				

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/004:SHE Induction Training</b>	

**A) Safety and Health induction training Topic****1. Hazard Identification Procedure**

Hazards on site:

- Falls
- Earthing work
- Electricity
- Machinery
- Handling materials
- Transport
- Site housekeeping
- Fire

**2. Personal Protective Equipment**

- What is available?
- How to obtain it?
- Correct use and care

**3. Health**

- Site welfare facilities
- Potential health hazards
- First Aid/Cardio-Pulmonary Resuscitation (CPR)

**4. Duties of the Contractor**

- Brief outline of the responsibilities of the Contractor by law
- Details of Contractor's accident prevention policy
- Maha-Metro's SHE manual
- Building and other Constructions Welfare Law


**5. Employee's Duties**

- Brief outline of responsibilities of employee under law
- Explanation of how new employees fit into the Contractor's plan for accident prevention. (Induction and orientation).

**B) Environment induction training Topic**

- Contractor's Environment Policy
- Avoidance of Nuisance
- Environmental Sanitation
- Dust Control Measures
- Water Pollution and Control
- Occupational noise mitigation
- Waste Management and Disposal
- Key legal requirements

**Note: This is a sample list; other topic can also be included in first day induction training**

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/005: ID Card Format</b>	


(85 mm x 55mm)

Front side of ID card:

Pune Metro Rail Project	
<div style="border: 1px solid black; width: 60px; height: 30px; margin: 0 auto; text-align: center; font-size: 8px;">Company Logo</div>	<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto; text-align: center; font-size: 8px;">Name &amp; Address of Main / Sub / Labour contractor</div>
<div style="border: 1px solid black; padding: 5px;"> ID Card No: Name: Designation: Blood Group: Valid up to: </div>	<div style="border: 1px solid black; width: 80px; height: 70px; margin: 0 auto; text-align: center; font-size: 10px;">Photo</div> <div style="border: 1px solid black; width: 100px; height: 20px; margin: 10px auto; text-align: center; font-size: 8px;">Authorised Signatory</div>

Backside of ID card:

Employee Address: _____ _____ _____ _____
<div style="border: 1px solid black; padding: 5px; font-size: 8px;"> 1 This card is the property of "XX"(Main / Sub / Labour Contractor) and must be returned on demand and on transfer / cancellation of employment.  2 A charge will be levied for replacement of the card due to loss or theft  3 If found please return it to: </div>
<div style="border: 1px solid black; width: 200px; height: 40px; margin: 0 auto; text-align: center; font-size: 10px;">Main contractors' Address</div>

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/006: SHE Training details for Managers and Supervisors</b>	

<b>1. The Law and Safety</b> Statutory requirement Appropriate regulations Duties of employer and employee	<b>2. Policy and Administration</b> Effect of incentive on accident prevention Human relations Consultation Safety Officer: duties, aims, objectives
<b>3. Safety and the Supervisor</b> Safety and efficient production go together Accidents affect morale and public relations	<b>4. Principles of Accident Prevention</b> Attitudes of management, supervision, and operations Methods of achieving safe operations Accident and injury causes
<b>5. Site Inspection</b> The role of management Hazard Identification Procedure Records results Follow-up procedures Feedback	<b>6. Human Behaviour</b> Motivating agencies Individual behaviour Environmental effects Techniques of persuasion
<b>7. Site housekeeping</b> Site organization Relationship of site housekeeping to accident occurrence Site access Equipment storage Material stacking Materials handling	<b>8. Health</b> Medical examination Hazard to health on site Sanitation and welfare Protective clothing First Aid/CPR
<b>9. Personal Protective Equipment</b> Eye, face, hands, feet and legs Respiratory protective equipment Protection against ionizing radiation	<b>10. Electricity</b> Appreciation of electrical hazards Power tools Arc welding Low voltage system Lighting and power system on sites ELCB, RRCB, Grounding/Ground fault circuit interrupters (GFCIs)
<b>11. Oxygen and Acetylene Equipment</b> Cylinder storage and maintenance Condition and maintenance of valves, regulators, and gauges Condition and maintenance of hoses and fittings Pressures	<b>12. Equipment</b> Accidents related to moving parts of machinery Appreciation of principles of guarding  Importance of regular maintenance
<b>13. Transportation</b> Transport to and from site Hazard connected with site transport Competent drivers Dumpers Tipping trucks Movement near excavations	<b>14. Excavations</b> Method of shoring Precautions while shoring Precautions at edge of excavations Removal of shoring Sheet steel piling
<b>15. Working platforms, Ladders, and Scaffolding</b> Hazards connected with the use of ladders Maintenance and inspection Type of scaffold Overloading Work on roofs Fragile material	<b>16. Cranes and other Lifting Machines</b> Licensing, certification, and training required for operation of cranes Slings methods Signalling Access to crane(s) Maintenance and examination


Openings in walls and floors Use of safety belts and nets	Ground conditions Hazards and accident prevention methods connected with the use of different types of cranes/heavy equipment Crane Lift Plan for all lifts
<b>17. Lifting Tackle</b>	<b>18. Fire Prevention and Control</b>
Slings - single and multi-legged Safe working loads (SWLs) Safety hooks and eyebolts Cause of failure Maintenance and examination	Principle causes determining fire Understanding fire chemistry Fire fighting equipment Fire fighting training
<b>19. Communications</b>	<b>20. Manual Handling</b>
Effective methods of communication (particular interest to non-English speaking workers) Method and preparation of reports Safety committees Safety meeting	Body posture and procedure for lifting, pushing, pulling, dragging, sitting and walking Ergonomics Stretching exercises

### **CONTENTS OF ENVIRONMENTAL TRAINING PROGRAMME**


1. Environment Policy
2. Regulatory requirements i.e. Central, State and Environmental requirement of funding agency
3. Overview of Environmental issues at construction sites and funding agency's requirements.
4. Avoidance of nuisance
5. Environmental sanitation
6. Dust control measures
7. Contractual requirements to reduce construction related impacts
8. Monitoring of environmental parameters and their significance
9. Waste Management
10. Occupational Noise and its mitigation
11. Health impacts of construction industry
12. Green Buildings certifications (IGBC)
13. Resource minimization
14. ISO requirement (as applicable)



[illegible]

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/008: Days to Be Observed for Creating SHE Awareness</b>	

1 <sup>st</sup> Monday to Sunday of January	Road Safety Week (Subjected to confirmation from Ministry of Road Transport, Govt. of India every year.)
16 <sup>th</sup> February	Kyoto Protocol Day
March	Red Cross Month
4 <sup>th</sup> March	National Safety Day
7 <sup>th</sup> April	World Health Day
14 <sup>th</sup> April	Fire Safety Day
April 18 to 22	Earth Week
20 <sup>th</sup> April	Earth Day
20 <sup>th</sup> April	Noise Awareness Day
28 <sup>th</sup> April	ILO World Day for Safety and Health at Work
May 1 to 7	Emergency Preparedness Week
5 <sup>th</sup> June	World Environmental Day
12 <sup>th</sup> June	World Day against Child Labours
9 <sup>th</sup> July	Occupational Health Day
17 <sup>th</sup> October	World Trauma Day
1 <sup>st</sup> December	World AIDS Day

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/009: Minimum Requirements of SHE Communications</b>	

1. For the purpose of Minimum requirements of SHE Communication Posters / Signages / Video the contracts are categorized into the following groups:

Contract Value (Initial awarded value of contract)	Group
Upto 25 Cr	A
Upto 100 Cr	B
Upto 250 Cr	C
More than 250 Cr	D

2. Every contractor falling into the above groups shall prepare a SHE Communication Plan as a part of site specific SHE Plan and shall include the following minimum requirement of Posters / Signages / Video as applicable. In case readymade posters are available in any of the category from National Safety Council, Loss Prevention Association of India or any other safety related organisations they may procure the same and display it. In case the same is not available then the contractors shall make necessary arrangements to get the posters designed and printed on their own.

All the above are to be detailed in the Site SHE Plan and get an approval from the Employer before displaying the posters.

**Table 1: Minimum number of Posters**

SN	SHE Poster Title	Min No. of concepts each title	No. of Posters / Signage / Video			
			Group A Contract	Group B Contract	Group C Contract	Group D Contract
1.	Safety Culture	5	Each 10	Each 50	Each 75	Each 100
2.	Daily Safety Oath	1 English, 1 Hindi	Each 100	Each 200	Each 500	Each 1000
3.	Mandatory PPE Usage					
a)	Signages to display the messages like PPE ZONE, NO PPE ZONE, HARD HAT AREA etc.	2 types of sizes made up of metal sheet to be mounted at different locations	Each 25	Each 50	Each 75	Each 200
b)	Helmet	5	Each 25	Each 50	Each 75	Each 200
c)	Shoe	5	Each 25	Each 50	Each 75	Each 200
d)	Goggles & Ear Protection	5	Each 25	Each 50	Each 75	Each 200
e)	Full Body Harness	5	Each 25	Each 50	Each 75	Each 200
f)	Hi-Vi Jacket	5	Each 25	Each 50	Each 75	Each 200
4.	Emergency Management Plan	5	Each 25	Each 50	Each 75	Each 200
5.	Working at Heights	10	Each 25	Each 50	Each 75	Each 200
a)	Ladder, Stairway, Scaffold - Signages to display the messages like SAFE, UNSAFE, FIT FOR USE, AVOID USE etc.	5 types of sizes made up of metal sheet to be mounted at different locations	Each 25	Each 50	Each 75	Each 200
6.	Site Electricity	5	Each 25	Each 50	Each 75	Each 200
7.	Fire and Explosion	5	Each 25	Each 50	Each 75	Each 200
8.	Crane Safety	5	Each 25	Each 50	Each 75	Each 200
9.	Slings	5	Each 25	Each 50	Each 75	Each 200
10.	Rigging Procedures	5	Each 25	Each 50	Each 75	Each 200
11.	Excavation	5	Each 25	Each 50	Each 75	Each 200

SN	SHE Poster Title	Min No. of concepts each title	No. of Posters / Signage / Video			
			Group A Contract	Group B Contract	Group C Contract	Group D Contract
12.	Occupational Health (Mosquito Control, HIV/AIDS awareness, Dust Control, Noise Control, No Smoking/Spitting, etc.)	10	Each 25	Each 50	Each 75	Each 200
13.	First – Aid	3	Each 25	Each 50	Each 75	Each 200
14.	Labour Welfare Measures (Payment of Minimum Wages, Avoidance of Child labour, signing in the Muster Roll, In case of accidents-what to do? etc	5	Each 25	Each 50	Each 75	Each 200
15.	Importance of “Safety Handbook”	1	25	50	75	200
16.	Traffic Safety (Speed limit safe crossing and working within barricaded area etc.)	5	Each 25	Each 50	Each 75	Each 200
17.	Environmental Sanitation, Dust Control, Waste Management, Water Conservation, Tree Protection, General Environmental Awareness Measures against noise pollution etc	5	Each 25	Each 50	Each 75	Each 200
18.	Video in Hindi on PPE usage – 15 minutes duration	1	-	-	-	1


**Note 1:** Items mentioned under 17 is video. Items under 3 (a) and 5 (a) are metal signage boards and all other items are posters.

**Table 2:** Size of Posters / Signages

SN	Item	Size
1.	Posters – Standard	17"x22" –135 GSM 4 Colour Printing
2.	Posters – Special (Wherever required)	17"x22" card laminated FA Poster
3.	Posters - Mega size (Wherever required)	32"x40" Flex FA Poster
4.	First-Aid Booklet	6"x4"
5.	SHE Handbook	6"x4"
6.	Signages	Small: 12"x6" Big : 24"x12"
7.	Road Traffic Sign Boards	Strictly as per Indian Road Congress (IRC) specifications

**Table 3:** Safety Signage Colour (as per IS 9457)

SN	Type of signage	Colour
1	Mandatory	Blue
2	Danger	Yellow
3	Prohibit	Red
4	Safe conditions	Green

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/010: Experts / Agencies for SHE Services</b>	

SN	Organisation	Services
1.	Bureau Veritas Industrial Services (India) Pvt. Ltd., B-21 & 22, First Floor, Sector-16, NOIDA-201 301 (U.P.) Phone: 0120 - 2515055 Fax: 0120 - 2515248 E-mail: <a href="mailto:enp.delhi@in.bureauveritas.com">enp.delhi@in.bureauveritas.com</a>	<ul style="list-style-type: none"> <li>External SHE Audit</li> <li>SHE Management / Technical Training</li> </ul>
2.	Central Labour Institute Post box no: 17851, NSMonkikarMarg Sion, Mumbai- 400 022 Tel.: 022- 4092203 Fax: 022 – 4071986 E-mail: <a href="mailto:cli@dgfasli.nic.in">cli@dgfasli.nic.in</a>	SHE Management / Technical Training
3.	Construction Industry Development Council 801, 8th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019 E-mail: <a href="mailto:cidc@vsnl.com">cidc@vsnl.com</a>	SHE Management / Technical Training
4.	Delhi Productivity Council 1E/10, Swami Ramtirath Nagar New Delhi – 110 055 Tel.: 23522835	SHE Management / Technical Training
5.	Det Norske Veritas AS, 203, SavitriSadana 1, 11 PreetVihar Community Centre, New Delhi-110 092 Phone: 011-22531502/2253/1503, 22427688/22531278 Fax: 011-2253 0247 Website: <a href="http://www.dnv.com">www.dnv.com</a>	<ul style="list-style-type: none"> <li>External SHE Audit</li> <li>SHE Management / Technical Training</li> </ul>
6.	Dr AV Baliga Memorial trust Link House, Bagadur Shah ZafarMarg Press Area New Delhi – 110 002 Phone: 011 – 23311119	HIV / AIDS awareness
7.	Dr. Cris Research Centre for Occupational Health & Safety 306, Guru ArjunaDevBhawan, Ranjit Nagar Complex, New Delhi – 110 008 Phone: 9810040406 Fax: 011 – 25702929 E-mail: <a href="mailto:team@drcri.com">team@drcri.com</a> Website: <a href="http://www.drcri.com">www.drcri.com</a>	<ul style="list-style-type: none"> <li>Ambulance Room &amp; Van</li> <li>Communication Materials</li> <li>First-aid box</li> <li>First-aid Training</li> <li>HIV / AIDS awareness</li> <li>ID Card</li> <li>Medical Facilities</li> <li>SHE Orientation Training</li> </ul>
8.	DuPont Safety Resources, E.I. DuPont India Private Limited, ArihantNitco Park 6th Floor, 90, Dr. Radhakrishnan Salai, Mylapore, Chennai-600 004 Phone: 044-2847 2800, 2847 3752 Fax: 044-2847 3800 Mobile: 9381201040 Website: <a href="http://in.dupont.com">in.dupont.com</a>	SHE Management Training

SN	Organisation	Services
9.	Automech Engineering India Pvt. Ltd, L-1, Shivalay, Deenanath Mangeshkar Road, Pune-411004, Phone: 09423732672 E-Mail: <a href="mailto:info@automechengineering.in">info@automechengineering.in</a>	ISO certification services SHE Trainings External SHE audits T&P testing and certifications
10.	Green Cross Consultants 59, 7th Cross, 1st Floor, Jai Bharath Nagar, Bangalore-560 033 Phone: 080-2549 6782 E-mail: <a href="mailto:etgrangan@yahoo.com">etgrangan@yahoo.com</a>	SHE Management / Technical Training
11.	HSRTC, PENTASAFE, 201, 2nd Floor, Town Centre, AndheriKurla Road, Marol, Andheri (East), Mumbai-400 059 Phone: 022-2850 2210/20/50 Fax: 022-2850 2260 E-mail: <a href="mailto:training@penta-safe.com">training@penta-safe.com</a>	SHE Practical Field Training for Height Safety
12.	Institute of Driving Training & Research, Wazirabad Road, Adjoining Loni Road flyover. New Delhi – 110 094 Phone: 011 – 22813474, 22815833 Fax: 011 - 22811131	SHE Technical Training for Vehicle Drivers.
13.	Institute for Research, Development & Training of Construction Trades & Management, An Educational Institute, Society and Trust, 1st Floor, UVCE Alumni Association Building, K.R. Circle, Bangalore-560 001 Phone: 080-22294291/22243257 Fax: 080-22243257 E-mail: <a href="mailto:ubrco@vsnl.com">ubrco@vsnl.com</a> Website: <a href="http://www.instructindia.org">www.instructindia.org</a>	SHE Technical /Field Training
14.	International Engineering Company K – 10, South Extension, Part – 2, New Delhi – 110 049 Phone: 011 – 26254761, 26258130 Mobile: 9312260130 E-mail: <a href="mailto:ashok@intenco.net">ashok@intenco.net</a>	<ul style="list-style-type: none"> <li>Crane and Lifting appliances and Gears Certification</li> <li>SHE Practical Field Training for Crane Safety</li> </ul>
15.	L & T Eutectic 32, SivajiMarg, New Delhi – 110 015 Phone: 011 - 51419538, 51419539 Fax: 011 - 51419600 Website: <a href="http://www.Inteutecticwelding.com">www.Inteutecticwelding.com</a>	SHE Practical Field Training for Welding Safety
16.	Loss Prevention Association of India Ltd. Warden House, Sir P.M. Road, Mumbai – 400 001 Website: <a href="http://www.lpaIndia.org">www.lpaIndia.org</a>	SHE Management / Technical Training
17.	MFA Crucial Moments Healthcare Pvt. Ltd., 42, Okhla Industrial Estate, Phase – II New Delhi – 110 020 Phone: 011 – 55624000 Fax: 011 – 55624010 E-mail: <a href="mailto:contact@crucialmoments.net">contact@crucialmoments.net</a>	First-aid Training
18.	Modicare Foundation 4 Community Centre, New Friends Colony, New Delhi – 110 065 Phone: 011 – 5167235059 Fax: 011 – 26915469 E-mail: <a href="mailto:nivedita@modi.com">nivedita@modi.com</a> <a href="mailto:nivedita@gmavil.com">nivedita@gmavil.com</a> Website: <a href="http://www.modicarefoundation.org">www.modicarefoundation.org</a>	HIV / AIDS awareness


SN	Organisation	Services
19.	National Safety Council HQ and Institute Building 98A, Sector 15, industrial Area C.B.D Belapur, Navi Mumbai – 400614 Phone: 27579924	SHE Management / Technical Training
20.	NICMAR (National Institute of Construction Management and Research) 910,9th Floor, Hemkunt Chambers, 89, Nehru Place, New Delhi – 110 019 Phone: 011 – 51618415, 51618417, 51618418 Fax: 011 – 51618416	SHE Management / Technical Training
21.	Quality Growth Services Pvt. Ltd. H-13, Kirti Nagar, New Delhi – 110 015 Fax: 011 – 25431737 / 25438598 / 25918332 E-mail: <a href="mailto:ggs@ggspl.com">ggs@ggspl.com</a> Website: <a href="http://www.ggspl.com">www.ggspl.com</a>	ISO Certification
22.	Safety Engineers Association / Safety Educational Trust – India 2/257, First Floor, Dr.Ambedkar Nagar, Manapakkam, Chennai – 600 116 Phone: 044 – 22523461 E-mail: <a href="mailto:safetrustindia@rediffmail.com">safetrustindia@rediffmail.com</a>	SHE Management / Technical Training
23.	SHE Management Consultancy & Support Services, 145 A, Pocket-VI, (DDA Flats), KondliGharoli, MayurVihar-II, Delhi-110 096 Fax: 011-2262 5015 Mobile: 9811153873 E-mail: <a href="mailto:r_k_p@vsnl.net">r_k_p@vsnl.net</a>	SHE Management / Technical Training
24.	St. Johns' Ambulance Red Cross Road New Delhi – 110 001	First-aid Training
25.	Vexil Business Process Services Pvt. Ltd. 208, A/4, Savitri Nagar, New Delhi – 110 017 Mobile: 9350232714, 98102832201, 9350232716 E-mail: <a href="mailto:info@vexilbps.com">info@vexilbps.com</a> Website: <a href="http://www.vexilbps.com">www.vexilbps.com</a>	<ul style="list-style-type: none"> <li>Emergency Preparedness Mock drill</li> <li>SHE Management / Technical Training</li> </ul>
26.	Welding Research Institute Bharat Heavy Electricals Ltd. (BHEL) Trichirappalli, Tamil Nadu – 620 014 Phone: 0431 – 2577029, 2577283 Fax: 0431 – 2520770 E-mail: <a href="mailto:wri@bheltry.co.in">wri@bheltry.co.in</a>	SHE Practical Field Training for Welding Safety

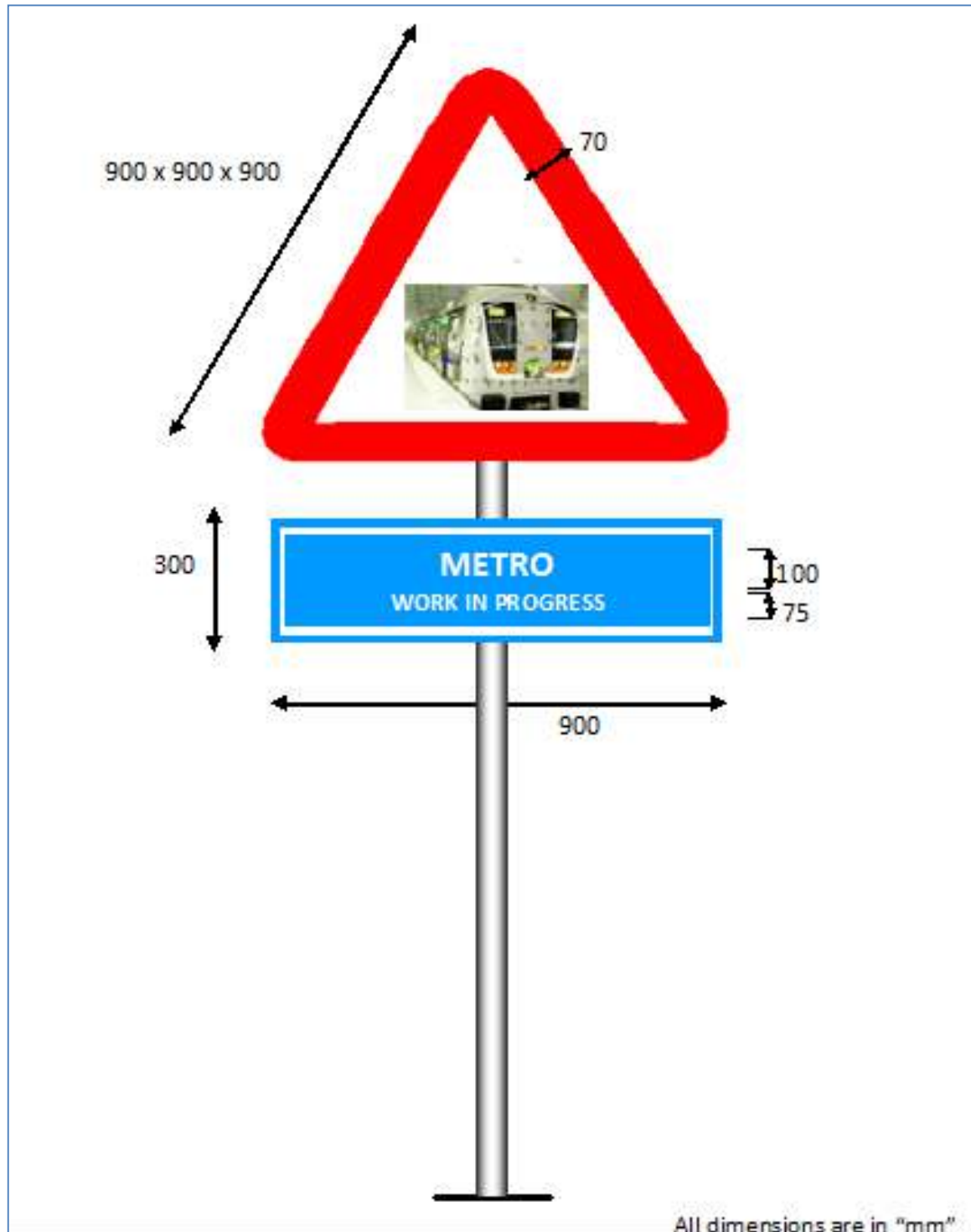

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**

**General Instruction: Maha-Metro/SHE/GI/011: Minimum Lighting Requirements**

SN	Facility or Function	Luminance – lx (lm/ft <sup>2</sup> )
1.	Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)
2.	<b>Construction areas</b> <ul style="list-style-type: none"> <li>• general indoor</li> <li>• general outdoor</li> <li>• tunnel and general underground work areas (minimum 110 lux required at tunnel and shaft heading during drilling, mucking and scaling)</li> </ul>	55 (5) 33 (3) 55 (5)
3.	<b>Access ways</b> <ul style="list-style-type: none"> <li>• exit ways, walkways, ladders, stairs</li> </ul>	110 (10)
4.	<b>Maintenance / Operating areas / shops</b> <ul style="list-style-type: none"> <li>• vehicle maintenance shop</li> <li>• carpentry shop</li> <li>• outdoors field maintenance area</li> <li>• refueling area, outdoors</li> <li>• shops, fine details work</li> <li>• shops, medium detail work</li> <li>• welding shop</li> </ul>	325 (30) 110 (10) 55 (5) 55 (5) 540 (50) 325 (30) 325 (30)
5.	Mechanical/electrical equipment rooms	110 (10)
6.	Hoists, Elevators, freight and passenger	215 (20)
7.	<b>Warehouses and storage rooms/area</b> <ul style="list-style-type: none"> <li>• indoor stockroom, active/bulk storage</li> <li>• indoor rack storage</li> <li>• outdoor storage</li> </ul>	110 (10) 270 (25) 33 (3)
8.	Health Centers and First aid stations and infirmaries	325 (30)
9.	Toilets, wash and dressing rooms	110 (10)
10.	Work areas – general (not listed above)	325 (30)
11.	Parking areas	33 (3)
12.	Visitor areas	215 (20)
13.	Laboratories	540 (50)



	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/012: Warning Traffic Sign</b>	





## MAHARASHTRA METRO RAIL CORPORATION LIMITED

### General Instruction: Maha-Metro/SHE/GI/013 :IGBC Document submission


#### Credit-wise list of documents applicable to respective contractor of Elevated and Underground Station

SSP MR1	Site environment Management	1. Emergency excavation plans / Site Management Plan (DWG) with photograph of site barricading and stacking of fresh material yard with signange
		2. Photograph of Wheel Wash Facility/ Grating/Manual cleaning
		3. Photograph of Water sprinkling
		4. Photograph of Covering excavated soil with tarpaulin or green net and tree protection at site
		5. Photograph of Diesel Storage area with drip tray
		6. Air & Noise test Reports at various locations in the station area along with photograph of monitoring measures during construction
		7. Environmental Management Plan
		8. Photograph of Waste Segregation with dust bins at the site
		9. Photograph of Electrical equipment covered at the site during civil construction and finishing
		10. Photograph of Covering of HVAC ducts
		11. Photograph of Scrap Material yard with signage
		12. Photograph of Good Housekeeping activities
		13. Photograph of Keep the Construction pathway free from interruption
		14. Photograph of DG Sets with proper exhaust (10m height from the breathing level)
		15. Photograph of Protect temporary area, and staircase using net or caution tape
		16. Traffic management permission and plan/policy along with photographs
		17. TopSoil test report showing porosity and percolation rate (Applicable only at grade station), also mentions the quantity and the process of preservation and uses and Photographs of Topsoil during excavation and preservation
SSP MR2	Basic Facilities for Construction Workforce	1. Welfare facilities and emergency excavation Plan for construction workforce for all stations (DWG)
		2. Photographs for basic facilities for the construction workforce - PPE Kits - First Aid & Medical Facilities - Sanitation facilities - Drinking-Water facilities
		3. Policy or contract documents and site layout for basic facilities for the construction workforce (Typical) - PPE Kits, First Aid & Medical Facilities, Sanitation facilities, Drinking-Water facilities, Assembly Point, Wheel cleaning area, Dustbin / waste storage area, DG, Fire-point, worker restroom etc.
SSP CR5	Preserve/Restor Tree	1. Tree Survey Report
		2. Details Trees inventory
		3. Permission for tree cutting from the authority
		4. PO of new saplings and name of the saplings
		5. Trees Maintenance Clause
		6. Site plan indicating the location of existing trees, before construction (Kindly Provide the Survey drawing showing the location of trees)

		7. Landscape plan (post-construction) highlighting the location of preserved/restored trees and newly planted saplings. In the landscape plan, please also provide a legend indicating the type of new plant species used (Kindly provide the landscape plan and also mention plant species)
		8. Photographs of Transplanted Trees with location
		9. Landscape plan and calculations demonstrating the percentage of the median area below the viaduct, covered with native/naturalized vegetation
		10. List of native / naturalized species planted in median area below the viaduct
		11. Photographs of landscape areas at various station locations
		12. Photographs of the median area below the viaduct tree plantation area
		13. Photographs during the tree plantation
		1. SRI Certificate for pavers from the manufacturer, also mention the distance from the manufacturer unit to the project location
		2. PO of the pavers block
		3. Photographs of Non Roof Areas, pavers blocks
SSP CR6.2	Heat Island Mitigation, Roof	1. PO and manufacturer specifications for SRI Paint (showing SRI Values) for exposed roof area
		2. Photographs of Exposed Roof Area
SSP CR8	Green Education	1. Any kind of Green Education Strategies, like Green Signage Program Environmental Awareness Program Tree Plantation Various Green Workshop, seminars or training programs for staff
		2. Photographs of the taken Green Education Strategies
WE MR1	Efficient Water Fixtures	1. A list of all plumbing fixtures installed( make and model no.) in the project indicating their flow and flush rates.
		2. Manufacturer letters (addressed to the project) or test certificates indicating the flow rates (at design water pressure of 3 bar) and flush rates of plumbing fixtures installed.
		3. Photographs of Installed Water Fixtures
		4. PO of installed Water Fixtures
WE MR2	Rainwater Harvesting, Station	1. Site storm water layout and storm water drain typical section
		2. Rainwater harvesting system sizing calculations (if applicable)
		3. Rainwater harvesting system plan, section (pits, storage tanks, etc.,) (if applicable) **If the ground Water table is less than 4m, such projects need not comply to the requirement. For these, need to submit the soil test report or Geo-technical Investigation report indicating the water table level
		4.Photos of Rainwater Harvesting System (if applicable) during construction and after construction at all the station Locations
WE CR1	Ultra Efficient Water Fixtures	Efficient Water Fixtures Details, PO, vendor certificate for Flow & Flush rate and photos
WE CR2	Rainwater Harvesting, Station and Viaduct	1. Total Length of Viaduct
		2. No of rainwater pits or tanks are provided throughout the viaduct
		3. Cross-sectional diagram for pits provided at viaduct area
WE CR3	Water Monitoring	1. Single line diagram (SLD) showing the installed water metering system (station wise, at least 2 locations in each station) (DWG)
		2. Photos of provided water meter

		3. PO of water meter
		1. Wall & Roof Construction Details (i.e., cross-section drawings in DWG) for all Air-Conditioned Spaces and fenestration details like a certificate from manufacturer mentioning the VLT, U-Value, SF, Make, and Model
		2. Lighting drawing layout (DWG) for all the proposed areas with fixture wattage and LPD level (station-wise)
		3. HVAC Layout (DWG) for all the stations
		4. List of HVAC Equipments space-wise for every station, Manufacturer Technical Specifications, PO and BOQ
		5. PO & BOQ of Lighting Fixtures
		6. Tender Document or Manufacturer test certificate for Escalator & Elevator, PO and VVVF technology Details
		7. Technical Specification of occupancy sensors in the toilet (if applicable)
		8. Technical Details and agreement/tender of BMS system if installed
		9. All office equipment such as printers, computers fax etc should be energy star-labeled. Please provide any contact agreement or policy regarding this.
		10. Pumps & Motors TDS, PO with VSD (Variable Speed Drive) systems.
		11. Photographs of All types of LED Lighting Fixtures
		12. Photographs of LED Signages inside stations
		13. Photographs of Occupancy Sensor (if applicable)
		14. Photographs of Escalator & Elevator VVVF control System
		15. Photographs of HVAC System
		16. Photographs of Pumps & Motors with VSDs system (Only of Under-Ground)
EE CR2	Eco-Friendly Refrigerants and Halon-free System	1. Technical specifications of installed fire suppression system
		2. A list of all Fire suppression systems used in the project
		3. A list of HVAC System and Technical details of refrigerants used in HVAC equipment & systems
		4. Photographs of installed Fire Suppression Systems
EE CR3	On-Site Renewable Energy	*If any renewable energy system is installed:
		1. Commissioning Report
		2. Capacity of the Installed Renewable Energy
		3. Technical Details of Installed Renewable Energy
		**If the installing Renewable Energy is in progress
		1. Tender Documents or LoA with the Agency
		2. Tentative Calculation for each station
EE CR5	Energy Monitoring	1. Schematic drawing showing the location of energy meters in the project
		2. Energy (kwh) meter manufacturer specifications and PO
		3. Photographs of Electrical Panel
MC CR1	Handling of Waste Materials, During Construction	1. Site logistic plan highlighting the construction waste segregation, storage, areas of topsoil storage, barricading, wheel washing area, labour facility (construction site management plan)
		2. A list of construction waste generated and diverted for reuse, recycle & land-fill within the project or outside the project
		3. Photographs taken at various stages of the project showing construction waste management yard and reuse of construction waste within site

		4. Letters from scrap dealers (addressed to the project) / contractors stating the type and quantity of construction waste received/ reused from the project site, for recycling/ reuse
MC CR2	Materials with Recycled Content	<p>1. Master material sheet (in excel format) listing all the civil and interior materials with quantities used in the project (BOQ will be acceptable to calculate the quantity of all building civil and construction materials)Note: For quantities, specify the units (Sqm, no., tons, cum, liters etc.,) in line with bills/PO</p> <p>2. PO for all civil and interior material listed in master material sheet indicating the cost</p> <p>3. Manufacturers letters (addressed to the project) indicating the percentage of post consumer post-industrial recycled content of the major materials used in project</p>
MC CR3	Local Materials	<p>1. Major civil and interior materials used in the project along with their cost. Clearly highlight the local materials and their corresponding cost along with approximate distance from the project site to the place of manufacturing unit.</p> <p>2. Manufacturer letters (addressed to the project) for local materials which are manufactured within a distance of 400km from project site.</p>
IEC CR1	Indoor Air Quality (IAQ) Monitoring	<p>1. For all station types and tunnel submit Indoor Air Quality (IAQ) management plan would be provided by Contractor's representative describing the strategies implemented during construction and pre-occupancy phases for addressing measures such as scheduling, electrical and mechanical equipment &amp; systems protection, housekeeping, isolating clean areas and source control (as applicable).</p> <p>2. Contractor's representative have to ensure and provide evidence indicating IAQ measures implemented at various development stages of the project such as construction, installation, commissioning and before occupancy phases of the project.</p>
IEC CR4	Low-Emitting Materials	<p><b>1. Paints &amp; Coatings:</b></p> <p>a. A list of low or no VOC content paints &amp; coatings (make &amp; model) used in the project interiors, along with the VOC content (in g/L, less water).</p> <p>b. Test certificate or manufacturer letters (addressed to the project) indicating the VOC content (in g/L, less water) of the paints &amp; coatings sourced.</p> <p><b>2. Adhesives:</b></p> <p>a. A list of low or no VOC content adhesives (make &amp; model) used in the project interiors, along with the VOC content (in g/L, less water).</p> <p>b. Test certificate or manufacturer letters (addressed to the project) indicating the VOC content (in g/L, less water) of the adhesives sourced.</p> <p><b>3. Sealants &amp; Sealant Primers:</b></p> <p>a. A list of low or no VOC content sealants &amp; sealant primers (make &amp; model) used in the project interiors, along with the VOC content (in g/L, less water).</p> <p>b. Test certificate or manufacturer letters (addressed to the project) indicating the VOC content (in g/L, less water) of the sealants &amp; sealant primers sourced.</p> <p><b>** Photographs of all the above mentioned materials</b></p>
IEC CR6	Daylighting	1. Manufacturer cut-sheet / brochure / letter of the proposed glass showing the visual light transmittance (VLT)

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>General Instruction: Maha-Metro/SHE/GI/014: Environmental Inspection Checklist</b>	

<b>Report No.:</b>		<b>Inspection Date:</b>		<b>Inspected by :</b>			
<b>Inspection Area:</b>							
<b>Participants:</b>							
Sl. No	Item	Compliance		Photograph	Observation & Recommendation	Action	
		Yes	No			By whom	Target date
<b>1.0</b>	<b>ENVIRONMENTAL SANITATION</b>						
1.1	Regular housekeeping done at site						
1.2	Materials are properly stored						
1.3	Construction equipment's and tools are kept properly						
1.4	Designated storage area for all materials as per requirement						
<b>2.0</b>	<b>CONTAINMENT OF AIR POLLUTION</b>						
2.1	Site is properly barricaded						
2.2	Dust generating materials are stored properly as per requirement given in the contract document						

2.3	construction equipment/ instruments/ construction material/debris/soil are not kept outside barricaded area						
2.4	Nearby roadways are clean from dust/Muck/debris						
2.5	Wheel washing facility is provided near the exit gate						
2.6	Wheel washing facility is in working condition						
2.7	Soil & debris stored in the site fully covered						
2.8	Regular water sprinkling						
2.9	Batching plant and / or casting yard area kept clean and neat						
2.10	Sufficient number of openings with exhaust fans are provided at cement storage area						
2.11	Proper PPEs are provided to workmen involved in manual cement handling						
2.12	Conveyor belt used for carrying aggregate are fully covered						
2.13	Access roads and internal circulation roads are well laid and maintained						
2.14	Stack height of DG set is as per norms						
2.15	Regular cleaning of toe dust						
2.16	Vehicle carrying construction materials, debris, muck etc are properly cleaned and covered						
<b>3.0</b>	<b>CONTAINMENT OF WATER POLLUTION</b>						


3.1	Water meters are provided as per requirements and are functional						
3.2	Waste water from site is not discharged into sewer without approval						
3.3	Waste water from RO reject, curing etc is put to effective use						
3.4	Transit Mixer washing facility /Beton washing provided at casting yard/batching plant						
3.5	Transit Mixer washing facility provided at casting yard/batching plant is functional						
3.7	Drainage system is functional						
3.8	Refuse/ excavate muck are not stored near the drains						
3.9	Site and adjacent areas are free from water logging						
3.10	Water consumption is recorded regularly						
<b>4.0</b>	<b>CONTAINMENT OF NOISE</b>						
4.1	Construction plant & equipments are serviced regularly						
4.2	Acoustic enclosures are provided for DG sets and maximum permissible sound pressure level is within 75dB(A) at one meter distance from the enclosure						
<b>5</b>	<b>WASTE MANAGEMENT</b>						
5.1	Adequate number of colour coded dust bins are available						
5.2	All waste items are deposited in refuse containers						



5.3	Bins are Emptied regularly						
5.4	No refuse is burnt at site						
5.5	Waste materials are properly stored at designated areas only						
5.6	C&D waste is not disposed along river bed, drainage & wet land						
5.7	Regular disposal of all types of waste as per law						
5.8	Availability of drip pans to prevent leakage and spill.						
5.9	No oil stains on ground						
5.10	Spill absorption material available						


Senior Environment Manager

Chief SHE Officer

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>Form No. SF/001: Formation of Site SHE Committee</b>	

<b>Contract No.</b>	
<b>Contractor Name</b>	
<b>Contract Title</b>	

<b><u>CIRCULAR</u></b>					
<b><u>Committee</u></b> The following SHE Committee is constituted with immediate effect:  Chairman: Members: <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> <li>3.</li> <li>4.</li> <li>5.</li> </ol>					
<b>Secretary</b>					
<b><u>Periodicity</u></b> The committee will meet at least once in a month on the day (specify date)					
<b><u>Agenda</u></b> Secretary will circulate agenda of the meeting at least two days in advance of the schedule date of the meeting.					
<b><u>Circulation</u></b> Gist of the meeting will be minuted in the standard format and circulated to the following under the signature of the secretary <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. Chairman</td> <td style="width: 50%;">3. Maha-Metro Representatives</td> </tr> <tr> <td>2. Members</td> <td>4. Others concerned</td> </tr> </table>		1. Chairman	3. Maha-Metro Representatives	2. Members	4. Others concerned
1. Chairman	3. Maha-Metro Representatives				
2. Members	4. Others concerned				
Date:	Signed By: -----				
<b>CHAIRMAN</b>					

	<b>MAHARASHTRA METRO RAIL CORPORATION LIMITED</b>
<b>Form No. SF/002: Minutes of SHE Committee Meeting</b>	

<b>Contract No.</b>			
<b>Contractor Name</b>			
<b>Contract Title</b>			
<b>Meeting No.</b>		<b>Date of Meeting</b>	
<b>Location of Meeting</b>			

MEMBERS PRESENT	INVITEES	MEMBERS ABSENT

REPORT SENT TO					
No. of Copies	Name / Dept.	No. of Copies	Name / Dept.	No. of Copies	Name / Dept.
<b>Prepared by:</b>		<b>Location:</b>		<b>Date:</b>	

**MINUTES OF SHE MEETING**

Item No.	Description of Discussion	Action By	Target	Remarks
1	Complaints received from Clients and corrective and preventive action			
2	Review of MOM of previous meeting			
3	NCR's / Observation from third party			
4	First - Aid cases / Reportable accident cases			
5	Future jobs and specific requirement			
6	Status of implementation of Safety plan			
7	Sub-contractor performance			
8	Analysis of first-aid cases			
9	Need for any specific system / training / PPE's / resources			

Item No.	Description of Discussion	Action By	Target	Remarks
10	Observation of SHE committee during last walk down			

Next, SHE Meeting is scheduled on:

<b>Date:</b>	<b>Chief SHE Manager (Signature &amp; Name)</b>
<b>Date:</b>	<b>Project Manager (Signature &amp; Name)</b>

**MAHARASHTRA METRO RAIL CORPORATION LIMITED**  
**(PUNE METRO RAIL PROJECT)**

**BID DOCUMENTS**

**FOR**

**Name of work:** Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works , Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks , Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project.

**TENDER NO. P1Misc-32/2024**

**(Part-IV,**

**Financial Bid & Bill of Quantities)**



**January- 2024**

**MAHARASHTRA METRO RAIL CORPORATION LTD**  
(A joint venture of Govt. of India & Govt. of Maharashtra)  
Civil Court Metro Station, Nyaymurti Ranade Path,  
Shivajinagar, Pune-411005,  
E-mail: [tenders.pmrp@mahametro.org](mailto:tenders.pmrp@mahametro.org)  
Website: [www.punemetrorail.org](http://www.punemetrorail.org)  
Telephone: 020-26051072

**Preamble and BOQ:**

- 1) The Bill of Quantities shall be read in conjunction with the instructions to Tenderers, Conditions of Contract, Notice Inviting Tender.
- 2) The currency of prices shall be expressed in Indian Rupees.
- 3) The price quoted by bidders shall be deemed to be inclusive of all kinds of duties, taxes, Cess and other levies payable as per GST, Custom tariff act etc. and as prevailing on 28 days (Base Date) prior to final date of submission of bid (Closing time & date of submission of online bid).
- 4) The quoted rates are for completed and finished items of work and complete in all respects. It will be deemed to have included all constructional plant, tools, machinery, labour, supervision, materials, fuel, oil, consumables, electric power, water, transportation, all leads and lifts, dewatering, all temporary works and false works, construction of temporary stores and buildings, fencing, watering, lighting, erection maintenance, night working, inspection facilities, safety measures at work sites/casting yard for workmen and road users, preparation of design and drawings pertaining to the casting yard, staging, shuttering, form work, stacking yard etc., establishment and overhead charges, labour camps, insurance costs for labour and works, contractor's profit, all taxes, royalties, duties, cess and other levies payable as per GST, Custom tariff act etc. and other charges together with all general risks, liabilities and obligations set out or implied in the contract and including remedy of any defects during the Defect Liability Period, unless otherwise provided in BOQ. Reinforcement (supply, cutting, bending, placing in position, tying etc.) shall not be paid separately unless otherwise mentioned in BOQ.
- 5) The whole cost of complying with the provisions of the Contract shall be deemed to have been included in the quoted rates.
- 6) The method of measurement of completed work for payment shall be in accordance with the requirements as stated in the individual sections of the Particular Schedule of SOR and Special Conditions of Contract (SCC).
- 7) Errors will be corrected by the Employer for any arithmetical errors in computation or summation as indicated in Contract Document.
- 8) Bidder may please note that to perform this contract, nothing extra shall be payable on account of field constraints, availability of front, preparation of detailed scheme for taking necessary clearance and approval from the concerned authority and other local bodies etc.
- 9) The Bidder shall complete and submit all bill sheets endorsed by the signature of authorized representative.
- 10) The bidder should quote on percentages basis i.e., below/ at par/ above on respective applicable Schedule of Rates i.e., CPWD DSR, PMC/PCMC DSR/SSR & Maharashtra State PWD SOR). These items will be operated from any of the above latest SOR as per priority defined and as approved by Maha Metro.

11) Detailed BOQ is as below:

Sr. No	Description	Maximum Tentative Amount (INR)	Quantity
1	Any item of works from CPWD DSR for scope of works as defined	38,50,00,000/-	As per actual quantities executed at site
2	Any item of works from PMC/PCMC DSR/SSR for scope of works as defined	10,00,00,000/-	
3	Any item of works from Maharashtra State PWD SOR for scope of works as defined	5,00,00,000/-	
4.	Open space development, construction of training centre, development of office space and stores for Operations and Maintenance as per BOQ attached. (Annexure A).	8,32,66,391/-	
Total Amount (INR) including GST @ 18%		61,82,66,391/-	

**IMPORTANT NOTES TO BIDDERS: -**

1. The bidder should quote on percentages basis i.e., above/ below/ At par in the Summary sheet in the "Financial Bid" of the Bid Document of MAHA-METRO.
2. For comparison of the quoted bid price by the bidders, the grand total of the quoted amount from schedule shall be taken into consideration.
3. Maha Metro reserves the right to omit / partially execute any items in any of the Schedules during construction without any liability to either party.

## Format for Financial Bid

Bid Document No.: .....

Dated:

To,  
**The ED/Procurement & Contracts**  
 Maharashtra Metro Rail Corporation Limited,  
 Civil Court Metro Station, Nyaymurti Ranade Path,  
 Shivajinagar, Pune-411005.

Sub: Tender No P1Misc-32/2024.

Name of Work: "Miscellaneous Works such as Construction of Industrial sheds, Godown, new buildings and Architectural Finishing Works, MEP works, Shifting of Civil and electrical Utilities, Construction, Repair & maintenance of roads, Demolition/Dismantling/Repairs of old Buildings, Boundary Walls, Underground water tanks, Horticulture & Landscaping Works etc. within PMC and PCMC area for Pune Metro Rail Project"

I / We hereby offer the following Amount in Rupees for the subject Tender as per terms and conditions of the tender.

Sr. No	Description	Maximum Tentative Amount (INR)	At Par/Above/ Below (In Percentage)	Amount ( INR Including GST)
1	Any item of works from CPWD DSR for scope of works as defined	38,50,00,000/-		
2	Any item of works from PMC/PCMC DSR/SSR for scope of works as defined	10,00,00,000/-		
3	Any item of works from Maharashtra State PWD SOR for scope of works as defined	5,00,00,000/-		
4.	Open space development, construction of training centre, development of office space and stores for Operations and Maintenance as per BOQ attached. (Annexure A).	8,32,66,391/-		
Total Amount (INR) including GST @ 18%		61,82,66,391/-		

a) I/We confirm that I/We have read and understood the rules and regulations regarding the bidding process and we have inspected the various conditions as present in the site and have also inspected the physical infrastructure available on the site, plans and specifications of site and offer my/our acceptance to execute work as per the terms and conditions contained herein in the Bidding documents.



b) This offer is being made after taking into consideration of all the terms and conditions stated in the Bid document, and after careful assessment of all risks and contingencies and all other conditions that may affect the financial Bid.

(c) I/We agree to keep my/ our offer valid for 180 days from the due date of submission of this Bid.

Signature (Authorized signatory): \_\_\_\_\_

Name of Signatory: \_\_\_\_\_

Designation: \_\_\_\_\_

Name & Seal of the Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Tel (M): \_\_\_\_\_

Tel (O): \_\_\_\_\_

Email: \_\_\_\_\_

Area Development for O&M Stores						
S.No	Item	GSB	UoM	Rate	Qty	Amount
1	GSB-CPWD-DSR-2023 (16.78)	Construction of granular sub base by providing close graded material conforming to specification, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads and lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compaction with vibrator roller to achieve the desired density, complete as per specifications and directions of engineer in charge				
		With material conforming to grade -1 (size range 75mm to 0.075) having CBR value-30	Cum	2,784.00	540.00	15,03,360.00
		<b>Total Amount</b>				<b>15,03,360.00</b>
S.No	Item	Fencing	UoM	Rate	Qty	Amount
1	PCC-CPWD DSR 2023 (4.20 A.2.2)	Concrete of M15 grade with minimum cement content of 240 Kg/cum. (Note : The permissible utilization of recycled concrete aggregate (RCA) as concrete and fine aggregate (RCA) as course aggregate and fine aggregate is 25% each)	Cum	9,135.05	9.19	83,932.84
2	Kerb Stone-CPWD DSR 2023 (16.69)	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, joined with cement mortar 1:3 (1 cement : 3 coarse sand), including making joints with or without grooves (thickness of joints except at a sharp curve shall not to be more than 5mm), including making drainage opening wherever required complete etc. as per direction of engineer-in-charge) (Length of finished kerb edging shall be measured to calculate volume for payment). (Precast C.C kerb stone shall be approved by Engineer-Incharge))	Cum	10,117.60	17.72	1,79,273.75
3	Vertical Post- In grating, frames, guard bar	steel work welded in built up sections/framed work, including cutting, hoisting fixing in position and applying prime coat of approved steel primer using structural steel etc as required.				
		ingratings, frames, guard bar, ladder, railing, brackets, gates and similar works	Kg	136.96	4,462.50	6,11,184.00
4	Fencing-CPWD DSR 2023 (16.70.1)	Providing and fixing GI chainlink fabric fencing of required width in mesh size 50mm x 50mm including strengthening with 2mm dia wire or nuts, bolts and washers as required complete as per the directions of engineer-incharge.				
		Made of G.I wire of dia 4mm	Sqm	1,017.80	630.00	6,41,214.00
5	Perepherial Pipes- MS block pipe of 38 mm dia	Providing and fixing MS block pipes of 38mm dia, of heavy guage of 14 including removing the bends, cutting the pipe and fixing the pipe in b/w the 2 vertical poles (MS rectangular poles) and spot welding the chain link with MS block pipe including cost of all materials wastage in cutting and scaffolding wherever necessary with all lead and lifts as directed	Rmt	389.82	1,706.25	6,65,130.38
6	PCC-CPWD DSR 2023 (4.20 A.2.2)	Concrete of M15 grade with minimum cement content of 240 Kg/cum. (Note : The permissible utilization of recycled concrete aggregate (RCA) as concrete and fine aggregate (RCA) as course aggregate and fine aggregate is 25% each)	Cum	9,135.05	4.73	43,163.11
7	Pedestal- CPWDDSR 2023 (5.33.1.2)	Providing and laying in position ready mixed or site batched design mix cement concrete for reinforced cement concrete work; using coarse aggregate and fine aggregate derived from natural sources, portland pozzolana/ordinary portland/portland slag cement, admixtures in recommended proportions as per IS: 9103 to accelerate/retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; excluding cost of centering, shuttering, finishing per directions of engineer in charge, and reinforcement will be paid seperately. <b>Note:</b> Extra cement up to 10% of the minimum specified cement content in design mix shall be payable, seperately. In case the cement content in design mix is more than 110% of the specified minimum cement content, the contractor shall have discretion to either re-design the mix or bear the cost of extra cement.				-
		All works up to plinth level: Concrete of M30 grade with minimum cement content of 350Kg/cum	Cum	9,655.70	13.65	1,31,800.31

8	Pedestal Steel-CPWD DSR 2023 (5.22A.6)	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete above plinth level				
		Thermomechanically treated bars of grade Fe-500D or more	MT	1,07,850.00	2.36	2,54,849.55
9	Painting- CPWD DSR 2023 (13.95)	Painting (One or More coats) on rain water , soil waste and vent pipes and fittings with synthetic enamel paint of approved brand and manufacture and required color on new works				
		75 mm dia pipes	RM	28.20	1,386.00	39,085.20
		<b>Total Amount</b>				<b>26,10,547.94</b>
<b>S.No</b>	<b>Item</b>	<b>Ramp</b>	<b>UoM</b>	<b>Rate</b>	<b>Qty</b>	<b>Amount</b>
1	PCC-CPWD DSR 2023 (5.33.2.2)	Providing and laying in position ready mixd or site batched design mix xement concrete for reinforced cement concrete work; using coarse aggregate and fine aggregate derived from natural sourses, portland pozzolana/OPC/PSC, admixtures in recommended proportions as per IS 9003 to accelerate/retard setting of concrete to improve durability and workability without impairing strength; including pumping of concrete to site for laying, curing, carriage for all leads; as per directions of engineer incharge,for the following grade of concrete.: <b>Note:</b> Extra cement up to 10% of the minimum specified cement content in design mix shall be payable seperately. In case the content in design mix is more than 110% of the specified minimum cement content, the contractor shall have discreation to either re design the mix or bear the cost of extra cement				
		Concrete of M30 grade with minimum cement content of 350 Kg/Cum	Cum	10,011.35	27.00	2,70,306.45
2	Reinforcement-CPWD DSR 2023 (5.22A.6)	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete above plinth level				
		Thermomechanically treated bars of grade Fe-500D or more	MT	1,07,850.00	5.40	5,82,390.00
		<b>Total Amount</b>				<b>8,52,696.45</b>
<b>PEB SHED FOR O&amp;M STORE</b>						
<b>S.No</b>	<b>Item</b>	<b>PEB</b>	<b>UoM</b>	<b>Rate</b>	<b>Qty</b>	<b>Amount</b>
1		Designing, providing, fabricating, painting, transportation, erection (using mechanised erection) and securing in position structural steel works, standing seam, profiled roof sheeting having provisions for roof monitor, inspection platform for buildings and workshops complete as per technical specifications and , approved shop drawings and /or instructions. Work under this item would generally cover				
		Cost to include but not be limited to all materials including wastage and all consumables, fastners of all types of both temporary and peramanent stays, labour temporary works including staging, scaffolding tools , pland and equipments , and cost of all incidentils and necessary testing of materials workman ship etc including cost of painting as per technical specifications, measurement will be on plan area along centre lines of exterior rows of columns for individual buildings .				
		designing, providing, fabricating and erecting hard dipped galvanised rainwater gutters using 3.15 mm thick mild sheets including all accessories , connection sleeves for connecting rain water pipes to gutters placed at roof along all valleys and edge of buildings including side seal ,w elding at all joints to make water lite including painting as per specifications.				
		supplying and fixing of standing seam profiled roof sheeting having provisions for supporting solar panel,with roof sheeting 600-630 cover width with rib height 74-76mm (basement thickness should be 0.55mm) or as approved with hot dip metallic coating of minimum 150 gms/sqm. zinc alluminium coating mass (55% aluminium , 43 % zink and 1.5% silicon coating mass total on both sides AZ-150 or equivalent as per AS 1397 -1993, minimum 550 Mpa yeald strength with silicon modified polyster (SMP) coating, (min silicon conten 30-50% or super polyster XRW quality paint coat of approved colour, coating shall be as per AS/NEZS-2728-1997, category -3 total coating thickness of 35 microns compraising of 20 microns exterior coat of SMP over super polyster XRW on top surface and 5 micron polyster reverse on back surface over 5 microns primer coats on boath surface including side and end laps (85% of total roof area)				

	PEB	Fixing arrangement - specially designed roof clips shall be used to hold standing seam roof sheet to the supporting structural member, the clip is designed to move freely in both the directions to take care of thermal expansion and contraction roof sheet side laps shall be field seamed by roof runner seaming machine which is self profiled and portable electrical lock seaming machine , the machine filled forms final 180 degree of a 360 degree double lock standing seem. all side lap sealant shall be factory applied butyl rubber hot metal selant . the anel end lap shall be joined by mean of yet to piece clamped connection consisting of a bottom reinforcing plate and top pannel strap, screw boalt type fastner shall be used for fixing , standing seem roof sheeting cliip as per manufacture specifications				
		The contractor shall give a mimimum 10 year guarantee to the client for sheets agains deterioration disintegration loss of lushers variations in colour etc and leakages across laps fasteners etc all types of steel sheets shall be load tested to satisfy one1.10 times the design wind load and coating thickness to the satisfactions of the engineer incharge fasteners ahal also be load tested, the contractor is to submit design and shop dwg for approval on the sheet profile design and details before installation.				
		Design, supply and erection of structural steel (confirming to IS :2062 grade) work for inspection platform using structural section including anchor bolt fabricated and erected to required profile and shape as called for hoisted installed in position including all cutting welding (continous welding wherever required and directed) grinding and all operations necessary templates adiqute temporary supports and scaffolding, staging etc. including all test on materials and fabrication as required item to include the cost of sand blasting whwreever required primer and painting as per the thecnical specifications for internal and external surfaces every precautions to be take against rusting of sections.( payment shall be on overall plan area of finished work basis between outermost edges)				
		plain .055 mm base metal thickness SMP coated galvalium/super polyster XRW zinalume sheet of similar material for edge capping pieces at apex of skylight / hips including notching turning down of capping between ribs etc all complete.				
		Providing supplying erecting and fixing in position 3mm thick polycarbonate sheets of approved texture and colour for roof lighting sheets to be profiled to match metal sheets and should include cost of laying sheets in curvature where required . Cost to include jointing sealing with bulyl adhesives and take as per manufacturers specifications and cover all cost of labour tools parts temp works etc all complete.				
			MT	1,56,236.97	90.00	1,40,61,327.30

#### MEP WORKS

S.No	Item -ELECTRICAL )	Description (LAR of Depot Contract)	UoM	Rate	Qty	Amount
	<b>Circuit/submain</b>					
1		Wiring for circute/submain wiring along with earth wire with the following size of FRLS PVC insulated copper conducted , single core cable in surface /recessed medium classe PVC conduit as required				
	CPWD DSR (E&M)1.14.3	2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	120.00	40,080.00
	<b>Wiring for Light/Power</b>					
2	CPWD DSR (E&M) 2022: 1.12	Wiring for light and power plug with 2x4 square mm FTLS PVC insulated copper conducted single core cable in surface/recessed medium class PVC conduit along with one no .4 sq mm FRLS PVC insulated copper conductor single core cable for loop earthing as required				
		2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	180	60,120.00
3	CPWD DSR (E&M) 2022: 1.23.1	Supply and fixing following piano type switch / socket on the existing switch box /cover including connection etc as required.				
		6A Switch -SIT	Nos	52.00	6	312.00
4	CPWD DSR (E&M) 2022 :1.27.6	Supply and fixing following size/modules, GI box along with modular base and cover plate for modular switches in recess etc as required				
		12 Module box	Nos	547.00	2	1,094.00

5	CPWD DSR (E&M) 2022 : 1.28.6	Supply and fixing following modular base and cover plate on existing modular metal boxes etc as required.				
		12 Module box base plate	Nos	272.00	2	544.00
6	CPWD DSR (E&M) 2022: 1.33	Supplying and fixing 3 pin , 5A ceiling rose on the existing junction box / wooden block including connections etc as required.	Nos	87.00	6	522.00
	<b>DB Secondary Light Point- fixture</b>					
7	CPWD DSR (E&M) 2022: 1.12	<b>Wiring for light and power plug with 2x4 square mm FRLS PVC insulated copper conductor single core cable in surface /recessed medium class PVC conduit along with one number per Sqmm FRLS PVC insulator copper conductor single core cable for loop earthing as required.</b>				
		2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	180	60,120.00
8	CPWD DSR (E&M)2022: 1.23.1	Supply and fixing following piano type switch / socket on the existing switch box /cover including connection etc as required.				
		6A Switch -SIT	Nos	52.00	6	312.00
9	CPWD DSR (E&M) 2022:1.27.6	Supply and fixing following size/modules, GI box along with modular base and cover plate for modular switches in recess etc as required				
		12 Module box	Nos	547.00	2	1,094.00
10	CPWD DSR (E&M) 2022: 1.28.6	Supply and fixing following modular base and cover plate on existing modular metal boxes etc as required.				
		12 Module box base plate	Nos	272.00	2	544.00
11	CPWD DSR (E&M) 2022 :1.33	Supplying and fixing 3 pin , 5A ceiling rose on the existing junction box / wooden block including connections etc as required.				
			Nos	87.00	6	522.00
	<b>Ceiling Fan Points Point</b>					
12	CPWD DSR (E&M) 2022: 1.12	<b>Wiring for light and power plug with 2x4 square mm FRLS PVC insulated copper conductor single core cable in surface /recessed medium class PVC conduit along with one number per Sqmm FRLS PVC insulator copper conductor single core cable for loop earthing as required.</b>				
		2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	60	20,040.00
13	CPWD DSR (E&M) 2022 : 1.23.1	Supply and fixing following piano type switch / socket on the existing switch box /cover including connection etc as required.				
		6A Switch -SIT	Nos	52.00	2	104.00
14	CPWD DSR (E&M) 2022 : 1.33+B70	Supplying and fixing 3 pin , 5A ceiling rose on the existing junction box / wooden block including connections etc as required.				
			Nos	87.00	2	174.00
	<b>Exhaust Fan Points</b>					
15	CPWD DSR (E&M)2022: 1.23.1	Supply and fixing following piano type switch / socket on the existing switch box /cover including connection etc as required.				
		6A Switch -SIT	Nos	52.00	4	208.00
16	CPWD DSR 2022: 1.23.4	Supply and fixing following piano type switch / socket on the existing switch box /cover including connection etc as required.				
		3-Pin 6A Socket - SIT	Nos	69.00	4	276.00
17	CPWD DSR 2022 :1.33	Supplying and fixing 3 pin , 5A ceiling rose on the existing junction box / wooden block including connections etc as required.	Nos	87.00	4	348.00
	<b>Point Wiring for 6A Socket Outlets</b>					
18	CPWD DSR 2022: 1.12	<b>Wiring for light and power plug with 2x4 square mm FRLS PVC insulated copper conductor single core cable in surface /recessed medium class PVC conduit along with one number per Sqmm FRLS PVC insulator copper conductor single core cable for loop earthing as required.</b>				
		2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	180	60,120.00
19	CPWD DSR 2022: 1.31	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess , including providing and fixing 3 pin 5x6 A modular socket outlet and 5x6 A modular switch connection etc as required.				
		6A Switch & Socket & Module box - SITC	Nos	477.00	6	2,862.00
	<b>Point wiring- 10A socket outlet</b>					

20	CPWD DSR 2022: 1.12	Wiring for light and power plug with 2x4 square mm FRLS PVC insulated copper conductor single core cable in surface /recessed medium class PVC conduit along with one number per Sqmm FRLS PVC insulator copper conductor single core cable for loop earthing as required.				
		2 x 4 Sqmm + 1 x 4 Sqmm FRLS Wiring	RMT	334.00	120	40,080.00
21	CPWD DSR 2022: 1.32	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5x6 and 15x16 A modular socket outlet and 15x16 A modular switch connections etc as required.				
		16A Switch & Socket & Module box - SITC	Nos	586.00	6	3,516.00
22	CPWD DSR 2022: 3.3.12					
		63 A TPN, 8 WAY	Nos	53,739.00	1	53,739.00
23	CPWD DSR 2022: 7.1.1	Laying of 01 no PVC insulated and PVC sheathed /XLPE power cable of 1.1 Cable Laying Upto - 35 Sqmm	RMT	387.00	600	2,32,200.00
24	CPWD DSR 2022: 9.1.34	supplying and making end termination with brass compression and gland and aluminium lugs for following size of PVC insulated and PVC sheathed / EXPE aluminium conductor cable of 1.1 KV grade as required.				
		4 core 25 Sq.mm End Termination	Nos	315.00	4	1,260.00
25	CPWD DSR 2022: 14.16.4	supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc conforming to IS 14930, part 2 complete with fitting and cutting, jointing etc direct in ground (75cm below ground level) including excavation and refilling the trench but excluding sand cushioning and protective covering etc complete as required.				
		160mm OD HDPE Pipe	RMT	481.00	200	96,200.00
26		Supply of LED highbay fixture having system lumen output of 14500 Lumens at a system power of 118 W, fixtures shall be made from PDC aluminium housing and dedicated lens optics to ensure IP 65 protection discrete high power LED THD 10% internal surge protection of 3KV similar to Philips CAT no BY415P LED 145SCW FG PSU GR				
		LED highbay fixture	Nos	12,609.14	12	1,51,309.68
27	CPWD DSR 2022: 4400	Ceiling fan 1200 mm	Nos	1,900.00	2	3,800.00
28		Providing and laying of 600mm x 600mm x 6.3mm GI plate with 2 nos 50x6mm GI strip from each electrode to inspection chamber 50mm dia medium class GI pipe. CI funnel with 20mm dia GI watering pipe wire mesh masonry chamber 300mm x 300mm heavy duty RCC manhole cover frame with locking arrangement completely painted with bitumin paint and packing with mixtures of charcoal and common salt around the plate electrode including digging of pit up to permanent moisture level but not less than 3.5 m to ensure earth resistance less than one ohm and backfilling as required and complete as per IS 3043 : 1997.				
		GI plate - Earthing	Nos	12,073.93	2	24,147.86
29	CPWD DSR 2022: 2913	25 x 6 mm thick GI tape.	Kg	58.00	50	2,900.00
30		supply, installation, testing and commissioning of propeller fans with motor Propeller Fans of Dia 380 mm	Nos	37,140.50	4	1,48,562.00
		<b>Total</b>				<b>10,07,110.54</b>
1	Miscellaneous	Additional Civil, Electrical and other works to be covered in latest DSR/SSR/PUNE SR.				10,00,000.00
<b>Total Amount (INR)</b>						<b>2,10,35,042.23</b>

IWB- Civil Works for Training Center										
Schedule	Item No.	Item Description	Unit	BOQ Qty IWB	BOQ Qty ADMIN	Total Qty	Rate BOQ exc GST @ 18%	Amount (Excl GST 18%)	Rate BOQ 18%	Amount (Incl GST 18%)
1		BLOCK WORK								
		Providing and constructing wall with light weight concrete block masonry (Aerocon block or equivalent) of size 600 x 200 x 200mm (l,b,h) strength not less than 3N/Sqm with cement mortar 1:6 confirming to IS: 2185 ( Part III) 1984, (Specifications for AAC ) and IS: 6041, and IS: 6441 1972 (Part I to Part V): including the cost of materials, labour, scaffolding, curing etc., complete as per the manufacturer's specifications for rectangular, curved or circular masonry works in pier or around the concrete columns/ walls etc., all as per specifications, drawings and as directed etc., complete at any height including all lead and lift. For 200mm thick wall.	Cum	250	0	250	5,032.90	12,58,224.58	5,938.820	14,84,705.00
2		PLASTERING WORK			0	0	-	-	-	
		Providing and applying 12 mm cement plaster of mix 1:4 (1 cement :2 parts coarse sand + 2 parts fine sand ) including providing galvanized chicken wire mesh at the junctions of concrete and masonry work including side laps of minimum 75mm and fixing in position with galvanized wire nails including scaffolding etc. complete.	Sqm	3500	0	3500	286.86	10,04,025.42	338.500	11,84,750.00
3		PUTTY WORK			0	0	-	-	-	
		Providing and applying 3mm 1.5mm thick exterior Birla/JK or equivalent ready made putty in two coats over Brickwork/ Blockwork/ RCC surface of ceiling/beam/column etc. to prepare even and smooth surface including sand papering, grinding, scaffolding etc., complete as per direction of Engineer-in-Charge.	Sqm	3500	0	3500	118.52	4,14,809.32	139.850	4,89,475.00
4		PAINTING WORK			0	0	-	-	-	
		Providing and applying Acrylic emulsion paint on new work with two or more coats of approved colour and shade to give an even shade .	Sqm	3500	0	3500	171.57	6,00,487.29	202.450	7,08,575.00
5		LINTEL CONCRETE -M20			0	0	-	-	-	
	As per PWD SSR 2020-2021 / 25.50	Providing and laying Cast in situ/Ready Mix cement concrete M-20 of trap/granite/quartzite/gneiss metal for R.C.C. beams and lintels as per detailed designs and drawings or as directed including steel centering, formwork, cover blocks, laying/pumping, compaction and roughening the surface if special finish is to be provided and curing etc. complete. (Excluding reinforcement and structural steel). with fully automatic microprocessor based PLC with SCADA enabled reversible Drum Type mixer/concrete Batch mix plant (Pan mixer) etc. complete. With fine aggregate (Crushed sand VSI Grade)	Cum	6.5	0	6.5	11,104.00	72,176.00	13,102.720	85,167.68
		MULLION CONCRETE -M20			0	0	-	-	-	
6	As per PWD SSR 2020-2021 / 25.11	Providing and laying in situ/Ready Mix cement concrete M-20 of trap/granite/quartzite/gneiss metal for R.C.C. work in foundations like raft, strip foundations, grillage and footings of R.C.C. columns and steel stanchion setc. including bailing out water, Steel centering formwork, laying/pumping cover blocks, compaction and curing roughening the surface if special finish is to be provided (Excluding reinforcement and structural steel) etc. complete, with fully automatic microprocessor based PLC with SCADA enabled reversible Drum Type mixer/concrete Batch mix plant (Pan mixer) etc. complete. With fine aggregate (Crushed sand VSI Grade)	Cum	15	0	15	6,440.00	96,600.00	7,599.200	1,13,988.00
		LINTEL (10 DIA MAIN ) & MULLION (12 DIA MAIN) REINFORCEMENT			0	0	-	-	-	
7	As per PWD SSR 2020-2021 / 26.33	Providing and fixing in position TMT-FE-500 bar reinforcement of various diameters for R.C.C. pile caps, footings, foundations, slabs, beams columns, canopies, staircase, newels, chajjas, lintels, pardis, copings, fins, arches etc. as per detailed designs, drawings and schedules including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required complete.	MT	2.5	0	2.5	65,117.00	1,62,792.50	76,838.060	1,92,095.15
		HILTI 10MM DIA			0	0	-	-	-	-
8	As per PWD SSR 2020-2021 / 53.02	Supplying, Drilling/Cleaning hole and injecting Hilti make ETA Approved RE500V3 chemical. Application to be designed separately for Rebars as Simply Supported, Moment or Splice Connection as per EC2/TR023 or relevant test and accepted rebarguidelines. The chemical should have ETA approval for seismic rebars as a minimum qualifying criterion. Drilling hole with double fluted type drill bits or hollow drill bits to the required depth by rotary hammer drill, cleaning with brush and jet of clean air, filling resin and hardener using serrated nozzle to eliminate mixing error with standard HDEA22 battery dispenser along with piston plug. The installation and the setting instructions should be strictly followed as per the manufacturer's recommendations. The adequate diameter and embedment of rebar should be decided as per PROFIS Rebar Software & the report to be submitted to the project manager/design engineer for approval. Scanning before drilling to be done to avoid hitting existing rebars. Re 500 -10 mm dia 200mm depth	Nos	280	0	280	436.00	1,22,080.00	514.480	1,44,054.40
		HILTI 12MM DIA			0	0	-	-	-	-
9	As per PWD SSR 2020-2021 / 53.03	Supplying, Drilling/Cleaning hole and injecting Hilti make ETA Approved RE500V3 chemical. Application to be designed separately for Rebars as Simply Supported, Moment or Splice Connection as per EC2/TR023 or relevant test and accepted rebarguidelines. The chemical should have ETA approval for seismic rebars as a minimum qualifying criterion. Drilling hole with double fluted type drill bits or hollow drill bits to the required depth by rotary hammer drill, cleaning with brush and jet of clean air, filling resin and hardener using serrated nozzle to eliminate mixing error with standard HDEA22 battery dispenser along with piston plug. The installation and the setting instructions should be strictly followed as per the manufacturer's recommendations. The adequate diameter and embedment of rebar should be decided as per PROFIS Rebar Software & the report to be submitted to the project manager/design engineer for approval. Scanning before drilling to be done to avoid hitting existing rebars. Re 500 -12 mm dia 240mm depth	Nos	560	0	560	541.00	3,02,960.00	638.380	3,57,492.80
		TILE WORK			0	0	-	-	-	-
10		Providing and laying matte finish vitrified tile of 1st quality of approved make conforming to IS :13755, The tiles shall be free from objectionable surface blemishes such as projections, depressions, flakes, hairline cracks and bubbles. The tiles shall be level and regular in size with properly formed corners and shall not be warped or deformed in any manner laid at right angles as per design and pattern if required, in all colors as per control sample at all levels in public & back-of-house areas and toilet floor and skirting over 20mm thick bed of cement mortar 1:4 (1 cement : 4 coarse sand) including pointing the joints with white cement and matching pigments- all complete as per relevant drawings and specifications laid over screed/ foam concrete as per relevant architectural drawing. Rates include coordination for cutouts, holes and finishing of the same. The flooring/ Tiles shall be covered with POP / Gypsum powder of 12mm thick / Plywood to ensure that the flooring is not damaged till the construction work is completed and handed over.	Sqm	1200	0	1200	1,249.78	14,99,735.59	1,474.740	17,69,688.00
		SKIRTING AND DADO WORKS			0	0	-	-	-	-
11		Providing and fixing 1st quality Vitrified wall tiles of approved make, conforming to IS :13755, The tiles shall be free from objectionable surface blemishes such as projections, depressions, flakes, hairline cracks and bubbles. The tiles shall be level and regular in size with properly formed corners and shall not be warped or deformed in any manner laid at right angles as per design and pattern if required, shade, colour and finish in all colours, shades, size in skirting, wall cladding, border tiles and dados over 20/12 mm thick bed of cement Mortar 1:4 (1 cement : 3 coarse sand) and jointing with approved grouting material with pointing in white cement mixed with pigment of matching shade complete. The flooring/ Tiles shall be covered with POP / Gypsum powder of 12mm thick / Plywood to ensure that the flooring is not damaged till the construction work is completed and handed over.	Sqm	900	0	900	1,247.66	11,22,894.92	1,472.240	13,25,016.00
		FALSE CEILING			0	0	-	-	-	-

12		Providing and installing suspended ceiling systems / vertical fascia as per controlled sample for concourse, 12mm thick Calcium Silicate Board panels with paint as per specification including supply of suspension system of galvanized steel as per manufacturer's recommendation, top fixing of SS expanding anchor bolts, rigid hangers, accessories inclusive of providing opening for electrical fixtures / fittings, fixed framing to support fixtures / fittings and providing secondary supporting system for cable tray and duct and all complete as per relevant drawings and the direction of Engineer- in- charge.	Sqm	230	0	230	1,660.74	3,81,969.58	1,959.670	4,50,724.10
		<b>GRID LIGHT WITH SWITHBOARD</b>			0	0	-	-	-	-
13		Supply, Installation, Testing & commissioning of luminaire - 70 Watt as per approved make of list. Fitting should have a aluminium pressure die cast housing with dedicated optics with protected LED's giving a lumen output of 7200 lumens with efficacy of more than 100 lm/W giving optimal light distribution for symmetric/asymmetrical configuration and used for height levels between 5-9 metres.A system efficacy of at least 100 lm/W with a lumen output of 7000 lumens and a CCT of 5700K with a power factor of >.90.It is designed to meet IP65 specifications ensuring L70 for 50000 burning hours with a TDH<20%.The luminaire complies with requirements of CE ,CISPR 15Ed72 , IEC 61347-2-13, IEC 61547, IEC 62384. (Concourse Double Height Area)	Nos.	125	0	125	4,847.32	6,05,915.25	5,719.840	7,14,980.00
		<b>CAT 6 POINTS</b>			0	0	-	-	-	-
14		All CAT-6 Cables shall be supply, cable laying, Testing and commissioning at site work by the Contractor. The LAN cables shall comply, as appropriate, with ISO/IEC 11801, EN 50173 and TIA/EIA 568 B series of standards for Category 6 and Category 7 cable types.Inner and outer sheath shall be FRLSZH type. All cable terminations between PLC to PLC panels shall be carried out by the contractor.	RMT	2135	0	2135	41.34	88,258.73	48.780	1,04,145.30
		<b>AC POINTS (2.5 SQMM)</b>			0	0	-	-	-	-
15		Point wiring for 24V socket outlets (for Inspection pit) with 3 x 2.5 sq mm (P+N+E) FRLSZH PVC insulated 1100V grade flexible stranded copper conductor wires in 25 mm dia recessed and/or surface mounted 2mm thick Smoke Free Fire Retardant Low Halogen rigid PVC Conduit the cost of providing saddles/hangers etc and also include the cost cutting/making good chases in brick work and including the cost of supplying and fixing modular grid plate mounted 24V, combined shuttered socket outlets along with switch of an approved quality and colour housed in zinc chromate passivated 2/2.5mm thk. boxes with moulded cover plate and interconnections and including the cost of loop earthing with 2.5 sq mm FRLSZH PVC insulated 1100V grade stranded copper conductor wires complete as per specifications and as required.	Nos.	20	0	20	4,093.75	81,875.08	4,830.630	96,612.60
16		<b>AC COPPER PIPE</b>			0		-	-	-	-
17		supplying, laying/fixing, testing and commissioning of appropriate nominal refrigerant copper pipe of 12.7mm dia (OD) for liquid line/suction line supply and return piping of suitable gauge (hard copper pipe for liquid main line and soft copper pipe for refrigerant) along with necessary supports, hangers, clamps, vibration isolators and fittings such as bends, tees, valves, gauges, strainers with insulation of 19mm thick elastomeric nitrile rubber along with application of multiccoating of VRV/VRF piping for protection against mechanical damages, fungal growth, flame spread, water permeance and ultraviolet radiations with OEM standards of VRV/VRF air conditioning system complete.	RMT	370	0	370	820.00	3,03,400.00	967.600	3,58,012.00
		<b>AC INSTALLATION</b>			0	0	-	-	-	-
18		Providing vaccumising the airconditioner system to 200 micron and charging with refrigerant R32 for 2TR window/split AC unit.	Nos.	20	0	20	2,335.00	46,700.00	2,755.300	55,106.00
		<b>GRANITE WORK AT WINDOW SILL &amp; WASH BASIN COUNTER</b>			0	0	-	-	-	-
19		Providing, laying, jointing, grouting including fixing in position to backing, prepolished, 20 mm thick granite, in sizes not less than 600x1200x20mm and rubbed to smooth mirror finish for Veneering/Cladding work to walls,beams, coloums, pilasters, fascia, upstands, jambs, sills, copings, soffits of openings and beams, with grout mortar of thickness to be ascertained at site so as to achieve true lines, levels, plumb, planes etc. subject to a minimum thickness of 20 mm for the grout cement mortar 1:4, and making of openings for service and other machine cutting, providing machine drilled holes, recesses, rebates for stainless steel attachments/ fixings, providing movement joints etc. all as per drawings, specifications and as directed complete. Provision to be made for "V" groove as per drawing, design and as approved by engineer.	Sqm	45	0	45	2,972.86	1,33,778.52	3,507.970	1,57,858.65
		<b>GLASS DOORS</b>			0	0	-	-	-	-
20		Providing and fixing of toughened laminated glass door in EFO ( 6mm + 1.52mm + 6mm) including stainless steel door handles, deadlock and Floor spring complete necessary cutting in granite flooring for housing of floor spring as / drawing	Sqm	33.45	0	33.45	5,249.47	1,75,594.92	6,194.380	2,07,202.01
		<b>TOILET CUBICAL</b>			0	0	-	-	-	-
21		Providing & fixing Toilet Cubicle (of following standard dimension which includes 900mm door size width) made of heat, bacteria, water,chemical,scratch, impact and anti bacterial resistant 12mm thick solid compact laminate panels tested in approved laboratory. Finish of the compact laminate should be Suede, Raw silk model includes doors, pilasters & intermediate panels finished with approved texture/shade as per the detail drawings & as per IS 2046 (Indian standard) and as per fire retardant BS-476/97 standard. This also includes providing and fixing in position necessary hardware made out of stainless steel (Grade 304) as per manufacturers specifications & Architects instructions like (1)Door knob(2)Gravity hinges(3)Thumb turn lockset with occupancy indicators(4)Coat hooks with Door stopper(5)U- channels(6)Adjustable foot/pedestal(7)Top rail with corner connector(8) Rubber noise deafening tape(9)Screws & wall plugs. All screws will of 304 Grade in stainless steel with satin finish. All pilasters are supported by stainless steel bottom cladding. The base of the stainless steel bottom cladding will be anchored to the floor with a clearance height up to 150mm. the top fitting should consist of SS round top rail which will get fixed with pilasters, with SS panel tube holder, SS corner bend (connected with top rail) will be used on the corner of cubicle in absence of brick wall, SS wall fixing is used only on the wall which will hold the SS top rail. Toilet Cubicle with standard dimension of 2025mm Height x 1000mm width x 1550mm Depth, which includes up to 900mm door size width)	Nos	8	0	8	27,673.75	2,21,390.03	32,655.030	2,61,240.24
		<b>TOILET WC</b>			0	0	-	-	-	-
22		Providing and fixing best Indian make White vitreous Chinaware water closet (European) wall hung with integral 'P' trap size 100 mm including fittings and clamps cutting and making good the walls and floors where required, including a. 32 mm CP brass flush valve concealed or exposed type with isolation valve, CP brass flush bend etc. b. Black coloured solid plastic seat & cover very heavy quality with rubber buffer fixed to the closet with	Nos	8	0	8	6,222.32	49,778.58	7,342.340	58,738.72
		<b>TOILET WASH BASINS</b>			0	0	-	-	-	-
23		Providing and fixing best Indian make white glazed vitreous Chinaware wash hand basin mounted on cantilever supports fixed to wall comprising a.Under counter oval wash basin size 550 mm x 400 mm similar to H.S. Cat. No. 10016. b. Cantilevered M.S. or C.I. supporting brackets c. 1 No. 15 mm CP brass self closing pillar tap. d. 32 mm CP brass waste with rubber plug and CP chain e. 32 mm CP brass (cast) bottle trap with extension piece to wall flange with rubber adpoter for waste connection f. 15 mm heavy quality CP brass angular stop cock with CP brass flexible connector pipe, nuts.	Nos	8	0	8	7,037.50	56,300.00	8,304.250	66,434.00
		<b>WATER PRROFING WORK</b>			0	0	-	-	-	-



24		Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of V.C., kitchen and the like consisting of:(a) Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface.(b) IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface.(c) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area.(d) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sqm).	Sqm	60	0	60	859.01	51,540.51	1,013.630	60,817.80
		TOILET URINALS			0	0	-	-	-	-
25		Providing and fixing vitreous chinaware urinal comprising a. Large flat back wall hung urinal in white glazed vitreous China 610mm x 400 mm x 380 mm b. 15 mm battery operated solenoid valve with infra red sensor mounted in a box with SS Cover c. CP brass chromium plated flush piping from valve to urinal terminated with a 15 mm screwed spreader d. 32 mm nominal bore CP cast brass waste e. 32 mm nominal bore CP cast bottle trap with extension pipe rubber adopter for waste connection	Nos	3	0	3	11,708.93	35,126.80	13,816.540	41,449.62
		TOILET URINAL PARTITION			0	0	-	-	-	-
26		Providing and fixing stone slab with table rubbed, edges rounded and polished, of size 75x50 cm deep and 18mm thick, fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in charge and finished smooth.The Granite shall be covered with POP / Gypsum powder of 12mm thick /Plywood to ensure that the flooring is not damaged till the construction work is completed and handed over. Granite Stone of a approved shade	Nos	2	0	2	1,334.65	2,669.31	1,574.890	3,149.78
		ALUMINIUM WINDOWS			0	0	-	-	-	-
27		Providing, fabricating and installing in position, pure polyester powder coated aluminum doors, windows, curtain walling, skylights, partitions, grilles, glazing with extruded aluminum sections and profiles complete in all respects in straight or faceted profiles including arched angular in elevation including sub frames in tubular aluminum (having mill finish), outer frames, architraves, beading, wool pile 6mm thick clear float glass, gaskets, all complete. The minimum sizes, thickness and weights per unit length of the aluminum sections to be given by bidder, however, nothing extra shall be payable to the Contractor for using larger/heavier sections than those given, if found inadequate including all fittings. Openable / sliding / side hung / windows	Sqm	100	0	100	3,995.33	3,99,533.05	4,714.490	4,71,449.00
		Additional Civil, Electrical and other works to be covered in latest DSR/SSR/PUNE SR.	LS			1	9,74,576.27	9,74,576.27	11,50,000.00	11,50,000.00
		SUB TOTAL AMOUNT EXCLUDING GST (CIVIL)						1,02,65,192.25		1,21,12,926.85
	A	Total Including GST @ 18 %						1,21,12,926.85		
FURNITURE - IWB BUILDING										
Schedule	Item No.	Item Description	Unit	BOQ Qty IWB	BOQ Qty ADMIN	Total Qty	Rate BOQ exc GST @ 18%	Amount (Excl GST 18%)	Rate BOQ 18%	Amount (Incl GST 18%)
	1.A	ROOM - I					1.07			
	1.A.1	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1500 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.  Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius  ROOM NO. 1 (TRAINING MANAGER) EXECUTIVE TABLE (1300X750X750 mm) WITH SIDE DUNNER (400X450X750 mm)	Nos.	1.00	0	1	65,295.09	65,295.09	72,007.67	72,007.67
	1.A.2	Executive Chairs Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	1.00	0	1	20,314.13	20,314.13	22402.5	22,402.50
	1.A.3	Visitors Chairs S- Kentilver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	3.00	0	3	8,061.01	24,183.02	8889.71	26,669.13
	1.A.4	File Cabinet 1000mm L x 450mm D x 750 w/ 4 Shutter, top lifting type shutter, See through glass Shutters Body and shelves of the File Cabinets shall be made out of 1mm thick CRCA Sheet. Shelves shall be adjustable.50mm lock with stainless steel flat keys in duplicate. Glass used should be of 3mm thick and Tata/Jindal/SAIL J Certifications are to be submitted Shutters shall be provided with 3 way locking device Godrej pattern Steel chromium plated handle 100mm long "Godrej Pattern" shall be provided Joinery and fittings complete and structure made from 18 mm BWR plywood, Type "AA", conforming to 15-303 and 151 marked. to facilitate assembly at site. 283: Back Panel: Should be made of 18mm Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue,, fitted with standard modular fitting process. All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius  GLASS DOOR FILE CABINET UNIT	Nos.	1.00	0	1	40,628.26	40,628.26	44805	44,805.00
	1.A.5	Sofa (03 Seater)	Nos.	1.00	0	1	58,039.25	58,039.25	64005.9	64,005.90
	1.A.6	Office Visitor Sofa Teak Wood Frame for 3 seater With High Density Foam Will be Used 16/26 Gun Pin for Frame Fixing Zig- Zag Spring For Better Strength/ Elastic Belt 1" Bounded Foam 100 Density Foam Brand : Sunflex/Sleepwell/ Century Foam Density : 50 Density With 25 Years Waaranty Mother Part Back elastic Belt Etc	Nos.	1.00	0	1	50,784.38	50,784.38	56005.2	56,005.20



		Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
		Table (1500X750X750 mm) WITH SIDE RUNNER (900x450x750mm).	Nos.	8.00	0	8	58,765.58	4,70,124.63	64,806.90	5,18,455.20
	1.C.2	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	8.00	0	8	20,314.13	1,62,513.05	22402.5	1,79,220.00
	1.C.3	<b>Trainee Chair with writing pad:</b> With dimensions H 36.6 x W 19.7 x D 29.9, with premium soft fabric upholstery is easy to maintain, seating height 19 inch , chrome plated 4-legs cantilever base esures stability. Fixed armrests with removable half writing pad transforms the chair into study nook, Maximum Load Capacity: 120 kg, sustainable and reusable packing	Nos.	64.00	0	64	13,059.17	8,35,786.79	14401.7	9,21,708.80
	1.C.4	Compactor Storage: Office Compactor Storages 200KG Capacity With Mobile Movement	Nos.	1.00	0	1	14,49,542.60	14,49,542.60	1598561	15,98,561.00
	1.C.5	<b>White Board</b> 6x3 Feet Whiteboard with Legs Both Sides Material Aluminum, Steel and PP Accessories included: Powder tray Frame Inner Dimensions, Width W x Height H (mm):1750x850 Main Unit Dimensions (W x D x H) (mm) 1880x560x1860 Board Dimensions (width W x height H) (mm) 1800 x 900 Surface Material: Steel (surface baking finish)	Nos.	8.00	0	8	13,059.17	1,04,473.35	14401.7	1,15,213.60
	1.C.6	Steel Racks (2100 x 900 mm) with glass door	Nos.	5.00	0	5	26,117.52	1,30,587.61	28802.5	1,44,012.50
					0	0	-	-	0	-
	1.D	<b>Room - B</b>			0	0	-	-	0	-
	1.D.1	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1500 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
		Table (1200X750X750)	Nos.	5.00	0	5	48,971.36	2,44,856.81	54005.8	2,70,029.00
	1.D.2	<b>Non Ececutive Chair:</b> High-quality fabric upholstery with high abrasion resistance and superior tear strength & colourfastness; Premium high-density virgin foam for comfortable seating; High stability chair with no-tip over, clearing drop test of 102kgs; Adjustable Lumbar Support for superior back support; Pneumatic Height Adjustment with BIFMA certified Class IV gas lift; Self-weight Multi-Locking Mechanism for easy recline without adjustments; Adjustable headrest for day-long comfort; Adjustable padded armrests clearing test of 40,000 cycles; Seat Material: Fabric; Leg Material: Chrome; Arm Type: Adjustable; Foam Density: Foam; Finish: Matte; Leg Colour: Black/Silver; Upholstery Colour: Black; Seat Colour: Black ;Seat Depth: 500mm; Back Height: 815mm; Back Type: High Back	Nos.	20.00	0	20	12,695.82	2,53,916.44	14001	2,80,020.00
		<b>Glass storage :</b>	Nos.	15.00	0	15	40,628.26	6,09,423.94	44805	6,72,075.00
	1.D.3	Width: <b>121 cm (47 5/8 ")</b> ; Depth: <b>37 cm (14 5/8 ")</b> ; Height: <b>134 cm (52 3/4 ")</b> ; Max. load/shelf: <b>32 kg (71 lb)</b> ; Material seel with glass door			0	0	-	-	0	-
	1.E	<b>Room - F</b>			0	0	-	-	0	-
		Trainer Table (1500X750X750) with pedestal	Nos.	1.00	0	1	48,971.36	48,971.36	54005.8	54,005.80
	1.E.1	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1500 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
	1.E.2	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	1.00	0	1	20,314.13	20,314.13	22402.5	22,402.50
	1.E.3	<b>Trainee Table (2100mmX750mmX750mm):</b> Supplying Providing & Fixing in position front standard table of size 2100mm Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.	Nos.	1.00	0	1	58,039.25	58,039.25	64005.9	64,005.90
	1.E.4	<b>Non Ececutive Chair:</b> High-quality fabric upholstery with high abrasion resistance and superior tear strength & colourfastness; Premium high-density virgin foam for comfortable seating; High stability chair with no-tip over, clearing drop test of 102kgs; Adjustable Lumbar Support for superior back support; Pneumatic Height Adjustment with BIFMA certified Class IV gas lift; Self-weight Multi-Locking Mechanism for easy recline without adjustments; Adjustable headrest for day-long comfort; Adjustable padded armrests clearing test of 40,000 cycles; Seat Material: Fabric; Leg Material: Chrome; Arm Type: Adjustable; Foam Density: Foam; Finish: Matte; Leg Colour: Black/Silver; Upholstery Colour: Black; Seat Colour: Black ;Seat Depth: 500mm; Back Height: 815mm; Back Type: High Back	Nos.	2.00	0	2	12,695.82	25,391.64	14001	28,002.00
	1.F	<b>Room - M</b>			0	0	-	-	0	-
	1.F.1	Steel Table (SS 304) for models as required size by engineer incharge	Nos.	6.00	0	6	29,019.42	1,74,116.55	32002.73	1,92,016.38

	1.F.2	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1500 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
		Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
		Table (1500X750X750 mm) WITH SIDE RUNNER (900x450x750mm).	Nos.	1.00	0	1	58,765.58	58,765.58	64,806.90	64,806.90
	1.F.3	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	1.00	0	1	20,314.13	20,314.13	22402.5	22,402.50
	1.F.4	<b>Trainee Chair with writing pad.</b> With dimensions H 36.6 x W 19.7 x D 29.9, with premium soft fabric upholstery is easy to maintain, seating height 19 inch , chrome plated 4-legs cantilever base esures stability. Fixed armrests with removable half writing pad transforms the chair into study nook, Maximum Load Capacity: 120 kg, sustainable and reusable packing	Nos.	8.00	0	8	13,059.17	1,04,473.35	14401.7	1,15,213.60
					0	0	-	-	0	-
	1.G	<b>Pantry</b>			0	0	-	-	0	-
	1.G.1	Granite Counter (2.5Ft Width)	RMT	10.00	0	10	1,531.87	15,318.68	1689.35	16,893.50
	1.G.2	Storage below ota	LS	1.00	0	1	2,01,527.25	2,01,527.25	222245.01	2,22,245.01
	1.G.3	<b>Fridge (236 Litre)</b> Capacity 235 litres; Annual Energy Consumption 265 Kilowatt Hours; Refrigerator Fresh Food Capacity 179 litres; Freezer Capacity 52 Litres; Installation Type Freestanding; Form Factor Freezer Top; Voltage 230 Volts;	Nos.	1.00	0	1	56,427.06	56,427.06	62227.97	62,227.97
	1.G.4	Microwave Oven 32D x 45.5W x 25.2H Centimeters, Auto Cook, Timer, Child Safety Lock, 20 litres capacity ; Power Output - 700 W   Microwave Power Levels – 5	Nos.	2.00	0	2	4,836.40	9,672.80	5333.6	10,667.20
	1.G.5	<b>RO + Dispenser</b> 55D x 52W x 145H Centimeters, Water Sparks Stainless Steel Water Dispenser Inbuilt with 100 LPH Reverse Osmosis (RO) Plant Storage Capacity 80 Liters – 3 Faucets (Hot, Cold, and Normal)	Nos.	4.00	0	4	45,142.47	1,80,569.86	49783.28	1,99,133.12
	1.G.6	Induction Stove: Dimentions 35D x 28W x 7H Centimeters Wattage2000 Watts	Nos.	1.00	0	1	14,509.83	14,509.83	16001.5	16,001.50
	1.G.7	Crockery and service utensils for pantry	LS	2.00	0	2	80,611.11	1,61,222.21	88898.23	1,77,796.46
					0	0	-	-	0	-
	1.H.1	Flush Door upto 35mm with locks and fittings (Wooden) (8 x 3 Ft) with required colour as required by engineer incharge	Nos	3.00	0	3	24,592.89	73,778.67	27121.13	81,363.39
							-			
		<b>SUB TOTAL AMOUNT EXCLUDING GST (FURNITURE)</b>						69,34,190.81		76,47,051.55
	B	<b>TOTAL AMOUNT INCLUDING GST @18% (A+B)</b>								
<b>CIVIL WORK UGC02/LAR/DSR- ADMIN BUILDING WORKS</b>										
<b>Schedule</b>	<b>Item No.</b>	<b>Item Description</b>	<b>Unit</b>	<b>BOQ Qty IWB</b>	<b>BOQ Qty ADMIN</b>	<b>Total Qty</b>	<b>Rate BOQ exc GST @ 18%</b>	<b>Amount (Excl GST 18%)</b>	<b>Rate BOQ 18%</b>	<b>Amount (Incl GST 18%)</b>
	1	<b>GLASS PARTITION</b>								
		Providing, fabricating and installing in position, pure polyester powder coated aluminum doors, windows, curtain walling, skylights, partitions, grilles, glazing with extruded aluminum sections and profiles complete in all respects in straight or faceted profiles including arched angular in elevation including sub frames in tubular aluminum (having mill finish), outer frames, architraves, beading, wool pile 6mm thick clear float glass, gaskets, all complete. The minimum sizes, thickness and weights per unit length of the aluminum sections to be given by bidder, however, nothing extra shall be payable to the Contractor for using larger/heavier sections than those given, if found inadequate including all fittings.								
	1.a	Fixed glazing	Sqm	0	60.000	60	7,110.65	4,26,639.15	8,390.570	5,03,434.20
	1.b	Extra for 12.76 mm thick (6mm + 0.76 + 6mm) PVB laminated glass,in place of 6 mm normal float glass	Sqm	0	60.000	60	4,008.69	2,40,521.19	4,730.250	2,83,815.00
		<b>GYP SUM PARTITION</b>					-	-	-	
DSR	As per PWD SSR 2020- 2021 / 51.03	Providing&Fixinginposition,AcousticalPanellingmadefromGypsumplain12mmpanelson,50x50mmSal-woodframeof600x600ctochohavingwoodensupportsfromwallofrequiredlength,infrontof1000Gmsyntheticoo50mmthickwithchickenmeshonwallside,includingcostofrequiredCut-Outs,decorativemouldings/finishing-items/paint&Scaffolding,asperArchitectural&AcousticalDesign&Instructions&Completeinallaspects. including all materials labour,finishing etc complete	Sqm	0	165.000	165	2,300.00	3,79,500.00	2,714.000	4,47,810.00
	2	<b>GLASS DOORS</b>				0	-	-	-	-
		Providing and fixing of toughened laminated glass door in EFO ( 6mm + 1.52mm + 6mm) including stainless steel door handles, deadlock and Floor spring complete necessary cutting in granite flooring for housing of floor spring as / drawing	Sqm	0	40	40	5,249.47	2,09,978.98	6,194.380	2,47,775.20
		<b>SUB TOTAL AMOUNT Excluding GST @18% (CIVIL WORK)</b>						12,56,639.32		14,82,834.40
	C	<b>Total Including GST @ 18%</b>						14,82,834.40		
<b>FURNITURE - ADMIN BUILDING WORKS</b>										
<b>Schedule</b>	<b>Item No.</b>	<b>Item Description</b>	<b>Unit</b>	<b>BOQ Qty IWB</b>	<b>BOQ Qty ADMIN</b>	<b>Total Qty</b>	<b>Rate BOQ exc GST @ 18%</b>	<b>Amount (Excl GST 18%)</b>	<b>Rate BOQ 18%</b>	<b>Amount (Incl GST 18%)</b>
	A	<b>O&amp;M WING NO OF CABINS - 10</b>								
		Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1200 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								



	Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	L - Shape Table ( Table - 1200x750x750) + Side Runner (900x450x750)	Nos.	0	10	10	-	-	92809.4	9,28,094.00
B	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	0	10	10	-	-	22402.5	2,24,025.00
C	<b>Visitors Chairs</b> S- Kentliiver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	20	20	-	-		1,77,794.20
								8889.71	
D	Modular Wooden Cubicals Shaped Work Stations / Desking System 1200mm Ht. (Supply with assembling & fixing) IA: Type Fixed Frame and Panel based system with overall thickness of 60 to 70 mm. 18: Skeleton: Should be made in powder coated Aluminium extruded Sections fixed firmly to the floor with Fix bolt and joined together with clips and fixtures. All sections should be powder coated in matt/glossy effect. Outer surface should be fully covered with aluminium extruder section. IC: Panels: Solid panels should be made from 6 mm PLY,IS 14587 Grade-I (Exterior). (Make-Greenply / Kitply/Century) with at least 1 mm thick laminate, ISI Marked (IS: 2046-1995). Edge banding Glued by hot melt glue. Panels are removable for facilitating services. Glazed panels should be made of 6mm float Glass panels with removable locking system Dual Raceways Will be Provided For the Wire Management All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius Work Station (1200x600x750) + Pedestal (400x400x600)	Nos.	0	36	36	-	-	72007.7	25,92,277.20
E	<b>Visitors Chairs</b> S- Kentliiver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	36	36	-	-	8889.71	3,20,029.56
F	Ply Wood Rafter above glass door and partition of 18mm upto ceiling (09 ft Height) for supporting glass work.	Sqm	0	97.00	97	-	-	1333.4	1,29,339.80
G	GRID CEILING REPAIR	Sqm	0	35	35	-	-	4178.74	1,46,255.90
H	GYPSUM PARTITION PAINT	Sqm	0	228.00	228	-	-	1066.72	2,43,212.16
			0		0	-	-	0	
	<b>DEPARTMENT NO OF CABINS -3</b>				0	-	-	0	
A	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1200 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
	Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	L - Shape Table ( Table - 1200x750x750) + Side Runner (900x450x750)	Nos.	0	4.00	4	-	-	92809.4	3,71,237.60
A.1	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	0	4.00	4	-	-	22401.5	89,606.00
A.2	<b>Visitors Chairs</b> S- Kentliiver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	8.00	8	-	-	8889.71	71,117.68
A3	Modular Wooden Cubicals Shaped Work Stations / Desking System 1200mm Ht. (Supply with assembling & fixing) IA: Type Fixed Frame and Panel based system with overall thickness of 60 to 70 mm. 18: Skeleton: Should be made in powder coated Aluminium extruded Sections fixed firmly to the floor with Fix bolt and joined together with clips and fixtures. All sections should be powder coated in matt/glossy effect. Outer surface should be fully covered with aluminium extruder section. IC: Panels: Solid panels should be made from 6 mm PLY,IS 14587 Grade-I (Exterior). (Make-Greenply / Kitply/Century) with at least 1 mm thick laminate, ISI Marked (IS: 2046-1995). Edge banding Glued by hot melt glue. Panels are removable for facilitating services. Glazed panels should be made of 6mm float Glass panels with removable locking system Dual Raceways Will be Provided For the Wire Management All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	Work Station (1200x600x750) + Pedestal (400x400x600)	Nos.	0	11.00	11	-	-	72007.7	7,92,084.70
A4	<b>Visitors Chairs</b> S- Kentliiver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	11.00	11	-	-	8889.71	97,786.81
A5	PLY WOOD PARTITION PLY FRAMING UPTO 5FT ABOVE GLASS PARTITION FOR FRAMING AND STRENGTH IOF	Sqm	0	26.00	26	-	-	1333.4	34,668.40
A6	GYPSUM PARTITION PAINT	Sqm	0	100.80	100.8	-	-	1066.72	1,07,525.38
A7	GRID CEILING REPAIR	Sqm	0	12	12	-	-	4178.74	50,144.88
			0		0	-	-	0	-
B	<b>ED &amp; GM CABIN 2 NO.</b>		0		0	-	-	0	-

B1	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1500 Length x 900 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
	Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	L - Shape Table ( Table - 1500x750x750) + Side Runner (900x450x750)+ Pedestal (400x400x600)	Nos.	0	2	2	-	-	92809.4	1,85,618.80
B2	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	0	2	2	-	-	22402.5	44,805.00
B3	<b>Visitors Chairs</b> S- Kentiliver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	14	14	-	-	8889.71	1,24,455.94
B4	<b>Office Visitor Sofa</b> Teak Wood Frame 2"x2" With High Density Foam Will be Used 16/26 Gun Pin for Frame Fixing Zig- Zag Spring For Better Strength/ Elastic Belt 1" Bounded Foam 100 Density Foam Brand : Sunflex/Sleepwell/ Century Foam Density : 50 Density With 25 Years Waaranty Mother Part Back elastic Belt Etc Sofa (01 Seater)	Nos.	0	4	4	-	-	48004.4	1,92,017.60
B5	<b>Office Visitor Sofa</b> Teak Wood Frame 2 seater High Density Foam Will be Used 16/26 Gun Pin for Frame Fixing Zig- Zag Spring For Better Strength/ Elastic Belt 1" Bounded Foam 100 Density Foam Brand : Sunflex/Sleepwell/ Century Foam Density : 50 Density With 25 Years Waaranty Mother Part Back elastic Belt Etc Sofa (02 Seater)	Nos.	0	1	1	-	-	56005.2	56,005.20
B6	<b>Office Visitor Sofa</b> Teak Wood Frame for 3 seater With High Density Foam Will be Used 16/26 Gun Pin for Frame Fixing Zig- Zag Spring For Better Strength/ Elastic Belt 1" Bounded Foam 100 Density Foam Brand : Sunflex/Sleepwell/ Century Foam Density : 50 Density With 25 Years Waaranty Mother Part Back elastic Belt Etc Sofa (03 Seater)	Nos.	0	2	2	-	-	64005.9	1,28,011.80
C	<b>Outside Cabin Area</b>		0		0	-	-	0	-
C1	Providing & Supplying With Installtion Front Table Supplying Providing & Fixing in position front standard table of size 1200 Length x 750 width x 750 mm Height, having all surface of 18mm thick BWR plywood, Type "AA", conforming to IS-303 and ISI marked./MDF, IS 14587 Grade-1 (Exterior) (Make-Greenply / Kitply/Century )covered with at least 1 mm laminate,ISI Marked (IS: 2046-1995) on all outside edges and backer lamination on other side, 0.8 mm PVC edge bands glued. The top is provided and fitted with all KD joinery and fittings complete. Table should have necessary provision for wire management data/computer/telephone cabling. Right hand side of the table will have 500 mm wide and 3 layers of lockable drawers.								
	Side Table: Supplying, Providing and fixing in position standard. table of size 900 Length x 450 width x 750mm Height, having all surface of 18mm thick Commercial plywood, lamination on other side, 2 mm PVC edge bands glued with hot melt glue. Edge to Edge Finish Bottom section should be divided into two horizontal sections and have sliding Shutters made from 18 mm Commercial plywood All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	L - Shape Table ( Table - 1200x750x750) + Side Runner (900x450x750)	Nos.	0	2	2	-	-	72007.7	1,44,015.40
C2	<b>Executive Chairs</b> Office Revolving Chair High Density Moulded Foam Will be Used in Cushioning Glass Filled With Nylon Back Rest With Lumber Support & Mesh Fabric 3D adjustable Armrest With Gel PU Pad Self Weight Synchro Tilt Mechanism With Multi Position Lock & Seat Slider 70MM Aluminium Base With Glass Filled Nylon Castors & Class 4 Gas Pump	Nos.	0	2	2	-	-	22402.5	44,805.00
C3	<b>Visitors Chairs</b> S- Kentiliver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	4	4	-	-	8889.71	35,558.84
C4	Modular Wooden Cubicals Shaped Work Stations / Desking System 1200mm Ht. (Supply with assembling & fixing) IA: Type Fixed Frame and Panel based system with overall thickness of 60 to 70 mm. 18: Skeleton: Should be made in powder coated Aluminium extruded Sections fixed firmly to the floor with Fix bolt and joined together with clips and fixtures. All sections should be powder coated in matt/glossy effect. Outer surface should be fully covered with aluminium extruder section. IC: Panels: Solid panels should be made from 6 mm PLY,IS 14587 Grade-I (Exterior), (Make-Greenply / Kitply/Century) with at least 1 mm thick laminate, ISI Marked (IS: 2046-1995). Edge banding Glued by hot melt glue. Panels are removable for facilitating services. Glazed panels should be made of 6mm float Glass panels with removable locking system Dual Raceways Will be Provided For the Wire Management All Material Will be in 18mm Commercial Ply With 2mm edge Binding CNC Machine Finish 1mm laminate Will be Hot-Press Temperature 500-700 Degree Celcius								
	Work Station (1200x600x750) + Pedestal (400x400x600)	Nos.	0	2	2	-	-	72007.7	1,44,015.40

	C5	Visitors Chairs S- Kentiliver With Stainless Steel Frame Synthetic Leather Seat & Back Breathable Sweat Free High Density Moulded Foam Will be Used in Cushioning	Nos.	0	2	2	-	-	8889.71	17,779.42
		SUB TOTAL AMOUNT EXCLUDING GST						-		74,92,287.67
	D	TOTAL AMOUNT INCLUDING GST @18%						-		
		GRAND TOTAL OF BOTH THE WORKS (A+B+C+D)						1,35,95,761.25		2,87,35,100.47

**Note**

The furniture may be provided brand of Godrej/Nilkamal or equivalent brand  
The above mentioned item at 1.B.4 may be the brand of epson/BenQ/Samsung etc or equivalent

Area Development for O&M -Admin Building Basement @ RHD									
S.No	Item	Item Description	UoM	Rate	L	B	D	Qty	Amount
1	Screed Concrete - CPWD DSR - 2023 (11.4)	52 mm thick concrete flooring with concrete hardner topping under layer 40mm thick cement concrete 1:2:4 (1cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) and top layer 12 mm thick cement hardener consisting of mix 1: 2 (1 cement hardener mix : 2 graded stone aggregate 6mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacturers specifications. this includes cost of cement slurry but excluding the cost of nosings of steps etc complete							
		Room -01	Sqm	978.45	12.50	7.10		88.75	86837.44
		Room -02	Sqm	978.45	10.40	7.10		73.84	72248.75
		Rentable Space -01	Sqm	978.45	21.00	8.40		176.4	172598.58
		Rentable Space -02	Sqm	978.45	38.00	7.10		269.8	263985.81
		Rentable Space -03	Sqm	978.45	20.45	10.35		211.66	207096.28
		S&T Room	Sqm	978.45	5.60	2.00		11.2	10958.64
		<b>Total</b>							<b>813725.50</b>
2	Cement Scirting - CPWD DSR - 2023 (11.6)	Cement plaster skirting up to 30 cm height , with cement mortor 1:3 (1cement: 3 coarse sand) finished with a floating coat of neat cement.							
		Room -01	Sqm	662.05	39.00	0.30		11.7	7745.99
		Room -02	Sqm	662.05	39.00	0.30		11.7	7745.99
		Rentable Space -01	Sqm	662.05	70.50	0.30		21.15	14002.36
		Rentable Space -02	Sqm	662.05	50.14	0.30		15.042	9958.56
		Rentable Space-03	Sqm	662.05	65.00	0.30		19.5	12909.98
		S&T Room	Sqm	662.05	15.20	0.30		4.56	3018.95
		<b>Total</b>							<b>55381.81</b>
	Wall Putty - CPWD DSR	Providing and applying plaster of paris putty of 2mm thick over plastered surface to prepare the surface even and smooth complete.							
		Room -01	Sqm	262.70				230	60421.00
		Room -02	Sqm	262.70				210	55167.00
		Rentable Space -01	Sqm	262.70				550	144485.00



3	2023 (13.26)	Rentable Space -02	Sqm	262.70				300	78810.00
		Rentable Space -03	Sqm	262.70				366	96148.20
		S&T Room	Sqm	262.70				100	26270.00
		Total							461301.20
4	Primer - CPWD DSR 2023 (13.85.3)	Applying priming coarse with primer of approved brand and manufacture having low VOC (volatile organic compound ) content .							
		Room -01	Sqm	73.95				230	17008.50
		Room -02	Sqm	73.95				210	15529.50
		Rentable Space -01	Sqm	73.95				550	40672.50
		Rentable Space -02	Sqm	73.95				300	22185.00
		Rentable Space -03	Sqm	73.95				366	27065.70
		S&T Room	Sqm	73.95				100	7395.00
		Total							129856.20
5		Wall painting with Acrylic imulsion paint having VOC (Volatile organic compound) content less than 50 grams/liter of approved brand and manufacture including applying additional cots wherever required to achive even shade and colour							
		Room -01	Sqm	137.45				230	31613.50
		Room -02	Sqm	137.45				210	28864.50
		Rentable Space -01	Sqm	137.45				550	75597.50
		Rentable Space -02	Sqm	137.45				300	41235.00
		Rentable Space -03	Sqm	137.45				366	50306.70
		S&T Room	Sqm	137.45				100	13745.00
		Total							241362.20
Total								17,01,626.90	
S.No	ELECTRICA	Description (LAR of Depot Contract)	UoM	Rate				Qty	Amount

1		Switch control primary light points: point wiring for switch controlled primary light points with 3x2.5 sqmm (P+N+E) 1100 volt grade FRLSZH PVC insulated standard copper conductor wires in 25 mm dia recessed and surface mounted 2mm thick smock free fire retardant low helogen rigid PVC conduit cost of providing saddles and hangers etc for surface conduiting and or cost of cutting and filling chases for recessed conduiting and including the cost of supplying and fixing modular grid plate flush mounted 24DV, 6amps control switch of an approved quality and colour housed in 2mm thick rust protector 120GSM GI box with moulded cover plate complete in all respect( the quoted price include cost of circute winning from DB to firdt switch in the sub circute ) complete as per specifications and as required							
2		Secondary Light Points: Point wiring for switch controlled secondary light points with 3C x 2.5 Sqmm (P+N+E) FRLSZH PVC insulated 1100 volt grade flexible copper standard conductor wires in 25mm dia recessed and or surface mounted 2mm thick smoke free fire retardent low halogen rigid PVC conduit cost of providing saddles and hangers etc for surface conduiting and or cost of cutting and filling for recessed conduiting complete in all respects as per specifications and as required	Nos	973.50				26	25,311.00

3		Celing Fan Point : wiring for celing fan point with 3x2 Sqmm (P+N+E) FRLSZH PVC insulated 1100 volt grade flexible copper standard conductor wires in 25mm dia recessed and or surface mounted 2 x 2.5 mm thick or as specalised smoke free fire retardent low halogen rigid PVC conduit cost of providing saddles and hangers etc for surface conduiting and or cost of cutting and filling for recessed conduiting complete as per specifications and also include the cost of supplying and fixing modular grid plate flush mounted 240V 6Acontroll switch and 240 V, 300 W, five step electronic humming free speed regulator of an approved quality and colour housed in 2mm thick as specified rust protected 120GSM GI box with moulded cover plate and with inter connection plate as per specifications and as required.	Nos	1,856.39				38	70,542.82
4		Exhaust Fan Points: Point wiring for exhaust fan points with 3x2 Sqmm (P+N+E) FRLSZH PVC insulated 1100 volt grade flexible copper standard conductor wires in 25mm dia recessed and or surface mounted 2 x 2.5 mm thick or as specalised smoke free fire retardent low halogen rigid PVC conduit cost of providing saddles and hangers etc for surface conduiting and or cost of cutting and filling for recessed conduiting complete as per specifications and also include the cost of supplying and fixing modular grid plate flush mounted including cost of supply and fixing 220 V, 240 V , 6A socket outlet near exhaust fan of approved quality and colour housed in 2mm thick or as specified rust protected GI box with moulded cover plate and with inter connection complete as per specifications and as required	Nos	1,550.86				7	10,856.02

5		<p>Point Wiring for Socket Outlets: Point wiring for 5A socket outlet with 3x2.5Sqmm (P+N+E) FRLSZH PVC insulated 1100 volt grade flexible copper standard conductor wires in 25mm dia recessed and or surface mounted 2 x 2.5 mm thick or as specialised smoke free fire retardent low halogen rigid PVC conduit cost of providing saddles and hangers etc as required and including the cost of cutting making good chesis in brick work and including the cost of supplying and fixing modular grid plate mounted 240V 3A 5 pin combined shuttered socket outlets along with 240 V 6A controll switch of approved quality and colour housed in 2mm thick rust protected GI box with moulded cover plate with inter connection and including the cost of loop earthing with 2.5sqmm FRLS ZH PVC insulated 1100 V grade standard copper conductor with complete as per specifications and as required.</p>	Nos	1,673.07				17	28,442.19
6		<p>Point wiring- 16A socket (outlet on each circuit ) with 3x4 Sqmm (P+N+E) FRLSZH PVC insulated 1100 volt grade flexible copper standard conductor wires in 25mm dia recessed and or surface mounted 2 x 2.5 mm thick or as specialised smoke free fire retardent low halogen rigid PVC conduit cost of providing saddles and hangers etc as required and including the cost of cutting making good chesis in brick work and including the cost of supplying and fixing modular grid plate mounted 240V 3A 5 pin combined shuttered socket outlets along with 240 V 6A controll switch of approved quality and colour housed in 2mm thick rust protected GI box with moulded cover plate with inter connection and including the cost of loop earthing with 2.5sqmm FRLS ZH PVC insulated 1100 V grade standard copper conductor with complete as per specifications and as required.</p>	Nos	2,195.64				9	19,760.76

7		supply, installation , testing and commissioning of LED 2x2 recessed fixtures with system lumen output of 3100 lumens at a system efficiency of 120 lumens Wthe luminary shall have powder coated CRCA housing and light out put with diffusion optics CRI>80 DALldimable driver and built in sensor on the luminary for use in cabins conference room, UGR less than 19complaint similar to philips RC 600 B LED 30S PSD W60 L60 or equivalent.	Nos	5,444.86				62	3,37,581.32
8		Supply , installation, testinf, commissioning of intelligent addressable microprocessor based multi certain smoke heat dedector with base 360 degree viewing alarm LED. The detector should be intelligent to automatically self optimised its sensitivity and can be programmed as head mode code dial addressing UL listed.	Nos	3,873.98				32	1,23,967.36
9		Supply , installation, testinf, commissioning of intelligent addressable microprocessor based multi certain smoke heat dedector with base 360 degree viewing alarm LED. The detector should be intelligent to automatically self optimised its sensitivity and can be programmed as head mode code dial addressing UL listed.	Nos	3,873.98				32	1,23,967.36
10		Supply, fixing, testing and commissioning of response indicators installed above false celing and locked rooms.	Nos	344.52				32	11,024.64
11		Providing, laying, connecting, testing and commissioning twisted pair shieded PVC insulated cable 2core 1.5sqmm ISI marked for fire telephone jack system including all accessories complete as required.	RMT	97.98				714	69,957.72
12		25mm dia PVC Conduit for FDA	RMT	123.84				714	88,421.76

13		Providing, laying, jointing and testing of following sizes of pipes conforming to IS 1239 part 1/1974 and part 11/1979 with all accessories like fitting with welded joint shall be used like tees, elbows, reducers, flanges, rubber gaskets, GI nut bolts, washers, and fixing the pipe on the floor /wall / celing with suitable size clamps, hangers to be provided wherever the pipes are crossing the walls floors and celing. including cutting holes and chesis in brick or RCC work ad making the good and same original conditions complete in all respects for fire fighting works.							
a		25 mm dia G.I Pipe	RMT	435.13				36	15,664.68
b		50 mm dia G.I Pipe	RMT	826.00				42	34,692.00
c		80 mm dia G.I Pipe	RMT	1,296.95				74	95,974.30
14		Providing two coats of synthetic enamel paint of approved shade over a cote of primer over pipes and supports including painting of legends both directions arrow as per the approval of the engineer incharge							
a		synthetic enamel paint a) 25mm	RMT	23.18				63	1,460.34
b		50 mm dia Paint	RMT	45.30				45	2,038.50
c		80 mm dia Paint	RMT	72.70				74	5,379.80
15		Supplying, fixing, testing and commissioning of following valves stainers gauges in the chilled plumbing duty insulator to the same specifications ast the connector piping and adequate supportors as per specifications BUTTERFLY VALVE (Manual) with C1 body SS disc nitrile rubber seal and O ring PN 15 pressure rating for chilled water /hot water circulation as specified							
		Butterfly valve	RMT	3,258.70				1	3,258.70
16		Providing, fixing, testing and commissioning 15mm dia quartzide bulb type GEM sprinkler head suitable to operate at 68deg .							
		GEM. Sprinkler- upright type	Nos	465.68				21	9,779.28
		GEM. Sprinkler- pendent type	Nos	465.68				21	9,779.28
17		Providing and fixing double plate adjustable roselte powder coated with matching colour for sprinklers of false celing area.	Nos	143.29				21	3,009.09

18		Providing and fixing SS flexible connection of 200psi rating for sprinkler heads from branch lines complete with nipple and nut, SS flexible pipe, gasket & wing clamp etc flexible pipe shall be UL listed Hose- 1.5m length	Nos	1,619.34				21	34,006.14
19		Supply, installation, testing and commissioning of propeller fans with motor complete electricals) in all respect & of following capacities. Propeller Fans of Dia 380 mm	Nos	37,140.50				6	2,22,843.00
	<b>B</b>	<b>Total</b>							<b>14,04,838.45</b>
S.No	Warehouse	Description	UoM	Rate				Qty	Amount
1		Multi Tier Storage racks -A type G+1 Floor Rack Size: 2500L x 600D x 4500H. Ground 3 Levels + first floor 3 levels Load capacity : 600 Kgs /Level	Set	18,40,000.00				1	18,40,000.00
2		Multi Tier Storage racks -B Type G +1 Floor Rack Size: 2500 L x 600 D x 4500 H Ground 3 Levels + first floor 3 levels Load capacity : 600 Kgs /level	Set	14,95,000.00				1	14,95,000.00
3		Multi Tier Storage racks -C Type G +1 Floor Rack Size: 2500 L x 600 D x 4500 H, Ground 3 Levels + first floor 3 levels Load capacity : 600 Kgs /level	Set	40,00,000.00				1	40,00,000.00
4		Mazzanine Floor -E Type G+1 Floor Load Capacity : 600 Kgs /Level	Set	39,00,000.00				1	39,00,000.00
5		Compactor System 4500L x 7000 D x 2150 H single Face Fixed Unit -01 Nos Double faced movable unit-07 Nos Single faced movable unit -01 Nos ,5 Levels per bay, Load Capacity -100 Kg UDL/Level	Nos	16,67,500.00				6	1,00,05,000.00
<b>6</b>		<b>Material Crates/ Bins of different sizes</b>							<b>-</b>
a		600L x 400 W x 485 H (Model CH64485)	Nos	1,107.00				1404	15,54,228.00
b		600L x 400 W x 160 H (Model CH64160)	Nos	473.00				2106	9,96,138.00
c		400L x 300 W x 320 H (Model CC43320)	Nos	446.00				69	30,774.00
d		400L x 300 W x 220 H (CC43220) with attached lids (LID4300) and stackable	Nos	506.00				207	1,04,742.00

e		Front partially open and stackable 350L x 210 W x 200 H( Model FPO 45)	Nos	304.00				1518	4,61,472.00
7		<b>Injection Moulded Plastic Pallets of</b>							
a		1200 L x 1000 W x 150 H (Model AP1210HW)	Nos	4,160.00				60	2,49,600.00
b		1200L x 1000W x 130 H (Model AP1210MW)	Nos	3,645.00				50	1,82,250.00
8		<b>Platform Hand Truck</b>							
a		Loading Capacity up to 100 Kg (Model PH 100)	Nos	9,350.00				5	46,750.00
b		Loading Capacity up to 500 Kg	Nos	13,200.00				5	66,000.00
c		Multipurpose service trolley with loading capacity up to 300 Kg	Nos	11,000.00				5	55,000.00
9		<b>Hand Pallet Truck</b>							
a		Loading capacity up to 1000Kg (BF115055085YEL)	Nos	21,275.00				2	42,550.00
b		Loading capacity up to 2500Kg (BF115055085YEL)	Nos	21,275.00				2	42,550.00
10		Manual stacker with loading capacity of 1000Kg and capable of lifting material up to 2.5 mt (Model No-NKMS1025YEL)	Nos	95,000.00				2	1,90,000.00
11		Scissor Lift Table with loading capacity of 600 Kg (Model No- NKSLT680YEL)	Nos	85,000.00				2	1,70,000.00
12		Mobile rack with open front storage bins	Nos	80,500.00				4	3,22,000.00
		<b>Total</b>							<b>2,57,54,054.00</b>
		GST @ 18 %							46,35,729.72
	<b>C</b>	<b>Total</b>							<b>3,03,89,783.72</b>
		<b>Grand Total (A+B+C)</b>							<b>3,34,96,249.07</b>