JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB)

Section 2 - Bid Data Sheet (BDS)

Section 3 - Evaluation and Qualification Criteria (EQC)

Section 4 –Bidding Forms (BDF) – Vol. I

Section 5 - Eligible Countries (ELC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

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Procurement of Works

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Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

INVITATION FOR BIDS

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

JAIPUR METRO RAIL CORPORATION LIMITED (JMRC)

Invitation for Bids

Date:	**16 November 2016**
Loan No. and Title	**3062- IND, Jaipur Metro Rail Line-1-Phase-B Project**
Contract No. and Title	**NCB No.- JP/EW/1B/JFT-1:** Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India
Deadline for Submission of Bids	**upto 1500 Hrs on 04 January 2017**

1. INDIA has received financing from the Asian Development Bank (ADB) toward the cost of Jaipur Metro Rail Line 1-Phase B Project. Part of this financing will be used for payments under the contract named above. Bidding is open to Bidders from eligible source countries of the ADB.

2. Jaipur Metro Rail Corporation (JMRC) ("the Employer") invites sealed bids from the eligible bidders for the Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India- NCB No.- JP/EW/1B/JFT-1 ("the Works").

3. National Competitive Bidding will be conducted in accordance with ADB's Single – Stage: Two- Envelope bidding procedure and is open to all eligible Bidders as described in the bidding document.

4. Only eligible bidders with the following key qualifications should participate in this bidding:

   4.1 Construction experience

   (i) Participation in at least one contract that has been successfully or substantially completed within the last seven years and that is similar to the proposed works, where the value of the Bidder's participation exceeds at least INR 22.62 crore. The similarity of the Bidder's participation shall be based on the physical size, nature of works, complexity, methods, technology or other characteristics as described in Section 6 (Employer's Requirements).

OR

(ii) Participation in at least two contracts that have been successfully or substantially completed within the last seven years and that are similar to the proposed works, where the value of the Bidder's participation exceeds at least INR 22.62 crore. The similarity of the Bidder's participation shall be based on the physical size, nature of works, complexity, methods, technology or other characteristics as described in Section 6 (Employer's Requirements).

In case of a Joint Venture, all partners must meet requirement as follows:

Either one partner must meet requirement or any two partners must each demonstrate one (1) successfully or substantially completed contract of similar size and nature

Notes:

1. Value of successfully completed portion of any ongoing work up to period of bid preparation will also be considered for qualification of construction experience criteria. Substantially completed means 80% of the contract value.

2. For successfully or substantially completed works, value of work done shall be updated to 'the deadline for submission of bids' price level assuming 2% inflation per year. Substantially completed means 80% of the contract value.

3. The exchange rate of foreign currency shall be applicable to the deadline for submission of bids.

4. Documentary proof such as successfully or substantially completed 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. In case the work is executed for private client, copy of work order, bill of quantities, bill wise details of payment received certified by Chartered Accountant under his signature, stamp and membership number, Tax Deducted at Source (TDS) certificates for all payments received and copy of final/last bill paid by client shall be submitted.

5. Only the value of contract as executed by the Bidder/Member in its own name should be indicated. Where a work is undertaken by a group, only that portion of the contract which is undertaken by the concerned applicant/member should be indicated and the remaining done by the other members of the group be excluded.

4.2 Pending Litigation

All pending litigation and arbitration, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than 60 percent of the Bidder's net worth calculated as the difference between total assets and total liabilities.

4.3 Financial Situation

4.3.1 Net worth**:** As a minimum, the Bidder's net worth for the last year calculated as the difference between total assets and total liabilities should be positive. Bidder either in single entity or each partner of the JV/Consortium must meet requirement.

4.3.2 Average Annual Construction Turnover**:** As a minimum, the Bidders should have average annual construction turnover of INR 56.54 crore calculated as total certified payments received for contracts in progress or completed, within the last three years. Bidder, if in single entity, must meet requirement by itself. Bidder, if in JV/Consortium should meet following requirements:

(a) Each partner must meet minimum 25% of the minimum requirement;
(b) At least one partner must meet 40% of the minimum requirement and
(c) All partners combined must meet the minimum requirement.

4.3.3 Financial Resources: The Bidder must demonstrate that it has the financial resources to meet current contract commitments, as defined in FIN-4 (Total Financial Requirements for Current Contract Commitments), plus the requirements for the Subject Contract of INR 7.07 crore –

(i) **In case of single entity** must meet requirement.

(ii) **In case of JV/Consortium** should meet following requirements:

(a) Each partner must meet minimum 25% of the minimum requirement;
(b) At least one partner must meet 40% of the minimum requirement and
(c) All partners combined must meet the minimum requirement.

4.4 Equipment requirement

For welding of Rails, the bidder shall have RDSO approved mobile Flash Butt Welding Plant with standardization of welding parameters for HH Rails along with final QAP approved by RDSO as per Addendum & Corrigendum slip No. 2 of Manual for Flash Butt Welding of Rails (Revision Jan. 2012) clause 5.6.2 as per Annexure – X & XI or shall have MOU with the owner of such welding plant owner and the same should be reflected under standard form mention in section 4- Bidding Forms.

5. Key details of the Bid are as under:-

Bid Security amount	:	Refer to the Bidding Document
Completion period of the Work	:	12 months
Period of Bidding Documents on inspection and sale	:	From 16.11.2016 to 04.01.2017 (between 09:30 hrs and 18:00 hrs) on all working days and on 04.01.2017 (between 09:30 hrs and 15:00 hrs)

6. To obtain further information and inspect the bidding documents, Bidder shall contact:

Mr. Ashwani Saxena, Director (Project)
Jaipur Metro Rail Corporation Limited,
3rd Floor, RSIC building, Udyog Bhawan,
Tilak Marg, C-Scheme,
Jaipur, Rajasthan, India
PIN - 302 005
Telephone: +91-141-5192 450, 455,458
Facsimile number: +91-141-5192 451
Electronic mail address: jmrctracktender1b@gmail.com

7. To purchase the bidding documents in English, eligible bidders should:

- write to address above requesting the bidding documents for: **"NCB No.- JP/EW/1B/JFT-1:** Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India**".**

- Pay a non-refundable fee of INR 21,000 (Twenty one thousand) only in the form of 'Demand Draft' in favour of "Jaipur Metro Rail Corporation Ltd" payable at Jaipur.

  Bidding document requested to be delivered by mail, will be dispatched by registered/speed post/courier upon payment of an additional amount of INR 5,000 for domestic applicants and INR 10,000 for oversees applicants. The Employer shall not be held responsible for the postal/courier delay, if any, in the delivery or non-delivery of the Bidding Documents.

8. Deliver your bid:

    - to the address above
    - on or before the deadline: up to 15.00 Hrs on 04.01.2017
    - together with a Bid Security as described in the Bidding Document

Bids will be opened immediately after the deadline for bid submission in the presence of bidders' representatives who choose to attend.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB)

Section 2 - Bid Data Sheet (BDS)

Section 3 - Evaluation and Qualification Criteria (EQC)

Section 4 –Bidding Forms (BDF) – Vol. I

Section 5 - Eligible Countries (ELC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

Preface

This Bidding Document for the Procurement of Works has been prepared by *Jaipur Metro Rail Corporation Limited* and is based on the Standard Bidding Document for the Procurement of Works–Small Contracts (*SBD Works-Small*) issued by the Asian Development Bank dated December 2015

ADB's *SBD Works-Small* has the structure and the provisions of the Master Procurement Document entitled "Bidding Documents for the Procurement of Works–Small Contracts", prepared by multilateral development banks and other public international financial institutions except where ADB-specific considerations have required a change.

Table of Contents - Summary Description

PART I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB) ---------- 1-1
This Section specifies the procedures Bidders should follow when preparing and submitting their Bids. Information is also provided on the submission, opening, evaluation of bids, and on the award of contract.

Section 2 - Bid Data Sheet (BDS) ---------- 2-1
This Section consists of provisions that are specific to each procurement and supplement the information or requirements included in Section 1 - Instructions to Bidders.

Section 3 - Evaluation and Qualification Criteria (EQC) ---------- 3-1
This Section contains the criteria to determine the lowest evaluated bid and the qualifications of the Bidder to perform the contract.

Section 4 - Bidding Forms (BDF) ---------- 4-1
This Section contains the forms which are to be completed by the Bidder and submitted as part of its Bid.

Section 5 - Eligible Countries (ELC) ---------- 5-1
This Section contains the list of eligible countries.

PART II REQUIREMENTS

Section 6 - Employer's Requirements (ERQ) ---------- 6-1
This Section contains the Specification, the Drawings, Supplementary Information that describe the Works to be procured, the Personnel Requirements, and the Equipment Requirements.

PART III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 7 - General Conditions of Contract (GCC) ---------- 7-1
This Section contains the general clauses to be applied in all contracts. These Conditions are subject to the variations and additions set out in Section 8 (Particular Conditions of Contract).

Section 8 - Particular Conditions of Contract (PCC) ---------- 8-1
This Section contains provisions which are specific to each contract and which modify or supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Section 9 - Contract Forms (COF) ---------- 9-1
This Section contains forms, which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 1 - Instructions to Bidders (ITB)

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

Section 1 - Instructions to Bidders

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Section 1 - Instructions to Bidders

A. General

1. Scope of Bid

1.1 In connection with the Invitation for Bids (IFB) indicated in the Bid Data Sheet (BDS), the Employer, as indicated in the BDS, issues this Bidding Document for the procurement of the Works as specified in Section 6 (Employer's Requirements). The name, identification, and number of contracts of this bidding are provided in the BDS.

1.2 Throughout this Bidding Document,

(a) the term "in writing" means communicated in written form and delivered against receipt;

(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

(c) "day" means calendar day.

2. Source of Funds

2.1 The Borrower or Recipient (hereinafter called "Borrower") indicated in the BDS has applied for or received financing (hereinafter called "funds") from the Asian Development Bank (hereinafter called "ADB") toward the cost of the project named in the BDS. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which this Bidding Document is issued.

2.2 Payments by ADB will be made only at the request of the Borrower and upon approval by ADB in accordance with the terms and conditions of the Financing Agreement between the Borrower and ADB (hereinafter called "Financing Agreement"), and will be subject in all respects to the terms and conditions of that Financing Agreement. No party other than the Borrower shall derive any rights from the Financing Agreement or have any claim to the funds.

3. Fraud and Corruption

3.1 ADB's Anticorruption Policy requires Borrowers (including beneficiaries of ADB-financed activity), as well as Bidders, Suppliers, and Contractors under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

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

(ii) "fraudulent practice" means 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;

(iii) "coercive practice" means 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;

(iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;

(v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) 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 (e) materially impeding ADB's contractual rights of audit or access to information; and

(vi) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;

(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the Borrower or of a beneficiary of ADB financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the Borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation;

(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a stated period of time, to participate[1] in ADB-financed, administered, or supported activities or to benefit from an ADB-financed, administered, or supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations; and

[1] Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one that either has been: (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the bidder's prequalification application or the bid; or (ii) appointed by the Employer.

(e) will have the right to require that a provision be included in bidding documents and in contracts financed by ADB, requiring Bidders, suppliers, and contractors to permit ADB or its representative to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by ADB.

3.2 Furthermore, Bidders shall be aware of the provisions of GCC 28.3 and 73.2 (i).

4. Eligible Bidders

4.1 A Bidder may be a natural person, private entity, or government-owned enterprise subject to ITB 4.5 – or any combination of them with a formal intent to enter into an agreement or under an existing agreement in the form of a Joint Venture. In the case of a Joint Venture:

(a) all partners shall be jointly and severally liable; and

(b) the Joint Venture shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the parties of the Joint Venture during the bidding process and, in the event the Joint Venture is awarded the Contract, during contract execution.

4.2 A Bidder, and all parties constituting the Bidder, shall have the nationality of an eligible country, in accordance with Section 5 (Eligible Countries). A Bidder shall be deemed to have the nationality of a country if the Bidder is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.

4.3 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to be in a conflict of interest with one or more parties in this bidding process if any of, including but not limited to, the following apply:

(a) they have controlling shareholders in common; or

(b) they receive or have received any direct or indirect subsidy from any of them; or

(c) they have the same legal representative for purposes of this bid; or

(d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to material information about or improperly influence the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or

(e) a Bidder participates in more than one bid in this bidding process, either individually or as a partner in a joint venture, except for alternative offers permitted under ITB 13 of the Bidding Document. This will result in the disqualification of all Bids in which it is involved. However, subject to any finding of a conflict of interest in terms of 4.3 (a) - (d) above, this does not limit the participation of a Bidder as a Subcontractor in another Bid or of a firm as a

Subcontractor in more than one Bid; or

(f) a Bidder or any affiliated entity, 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) a Bidder was affiliated with a firm or entity that has been hired (or is proposed to be hired) by the Employer or Borrower as Engineer for the contract.

4.4 A firm shall not be eligible to participate in any procurement activities under an ADB-financed, administered, or supported project while under temporary suspension or debarment by ADB pursuant to its Anticorruption Policy (see ITB 3), whether such debarment was directly imposed by ADB, or enforced by ADB pursuant to the Agreement for Mutual Enforcement of Debarment Decisions. A bid from a temporary suspended or debarred firm will be rejected.

4.5 Government-owned enterprises in the Employer's country shall be eligible only if they can establish that they (i) are legally and financially autonomous, (ii) operate under commercial law, and (iii) are not a dependent agency of the Employer.

4.6 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.

4.7 Firms shall be excluded if by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country or any payments to persons or entities in that country.

4.8 In case a prequalification process has been conducted prior to the bidding process, this bidding is open only to prequalified Bidders.

5. Eligible Materials, Equipment and Services

5.1 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as defined in ITB 4.2 above and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment, and services.

5.2 For purposes of ITB 5.1 above, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

B. Contents of Bidding Document

6. Sections of Bidding Document

6.1 The Bidding Document consist of Parts I, II, and III, which include all the sections indicated below, and should be read in conjunction with

any addenda issued in accordance with ITB 8.

PART I Bidding Procedures
Section 1 - Instructions to Bidders (ITB)
Section 2 - Bid Data Sheet (BDS)
Section 3 - Evaluation and Qualification Criteria (EQC)
Section 4 - Bidding Forms (BDF)
Section 5 - Eligible Countries (ELC)

PART II Requirements
Section 6 – Employer's Requirements (ERQ)

PART III Conditions of Contract and Contract Forms
Section 7 - General Conditions of Contract (GCC)
Section 8 - Particular Conditions of Contract (PCC)
Section 9 - Contract Forms (COF)

6.2 The Invitation for Bids (IFB) issued by the Employer is not part of the Bidding Document.

6.3 The Employer is not responsible for the completeness of the Bidding Document and their Addenda, if they were not obtained directly from the source stated by the Employer in the IFB.

6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Document. Failure to furnish all information or documentation required by the Bidding Document may result in the rejection of the bid.

7. Clarification of Bidding Document, Site Visit, Pre-Bid Meeting

7.1 A prospective Bidder requiring any clarification on the Bidding Document shall contact the Employer in writing at the Employer's address indicated in the BDS or raise his inquiries 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 prior to the deadline for submission of bids, within a period given in the BDS. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Document in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.

7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself, on its own risk and 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.

7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter 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 The Bidder's designated representative is invited to attend a pre-bid meeting, if provided for in the BDS. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

7.5 The Bidder is requested to submit any questions in writing, to reach the Employer not later than 1 week before the meeting.

7.6 Minutes of the pre-bid meeting, including the text of the questions raised, 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 Document in accordance with ITB 6.3. Any modification to the Bidding Document 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.

7.7 Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.

8. Amendment of Bidding Document

8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Document by issuing addenda.

8.2 Any addendum issued shall be part of the Bidding Document and shall be communicated in writing to all who have obtained the Bidding Document from the Employer in accordance with ITB 6.3.

8.3 To give prospective 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 in no case 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 Comprising the Bid

11.1 The Bid shall comprise two envelopes submitted simultaneously, one called the Technical Bid containing the documents listed in ITB 11.2 and the other the Price Bid containing the documents listed in ITB 11.3, both envelopes enclosed together in an outer single envelope.

11.2 The Technical Bid shall comprise the following:

(a) Letter of Technical Bid;

(b) Bid Security or Bid-Securing Declaration, in accordance with ITB 19;

(c) alternative Bids, at Bidder's option and if permissible, in accordance with ITB 13;

(d) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;

(e) documentary evidence in accordance with ITB 17, establishing the Bidder's qualifications to perform the contract;

(f) Technical Proposal in accordance with ITB 16;

(g) Any other document required in the BDS.

11.3 The Price Bid shall comprise the following:

(a) Letter of Price Bid;

(b) completed Price Schedules, in accordance with ITB 12 and ITB 14, or as stipulated in the BDS;

(c) alternative price Bids, at Bidder's option and if permissible, in accordance with ITB 13;

(d) Any other document required in the BDS.

11.4 In addition to the requirements under ITB 11.2, Bids submitted by a Joint Venture shall include a copy of the Joint Venture Agreement entered into by all partners. Alternatively, a Letter of Intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all partners and submitted with the Bid, together with a copy of the proposed agreement.

12. Letters of Bid and Schedules

12.1 The Letters of Technical Bid and Price Bid, and the Schedules, and all documents listed under Clause 11, shall be prepared using the relevant forms furnished in Section 4 (Bidding Forms). The forms must be completed without any alterations to the text, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested and as required in the BDS.

13. Alternative Bids

13.1 Unless otherwise indicated 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 When specified in the BDS pursuant to ITB 13.1, and subject to ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document 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.

13.4 When specified in the BDS, Bidders are permitted to submit alternative technical solutions for specified parts of the Works. Such parts will be identified in the BDS and described in Section 6 (Employer's Requirements). The method for their evaluation will be stipulated in Section 3 (Evaluation and Qualification Criteria).

14. Bid Prices and Discounts

14.1 The prices and discounts quoted by the Bidder in the Letter of Price Bid and in the Schedules shall conform to the requirements specified below.

14.2 The Bidder shall submit a bid for the whole of the works described in ITB 1.1 by filling in prices for all items of the Works, as identified in Section 4 (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 will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.

14.3 The price to be quoted in the Letter of Price Bid shall be the total price of the Bid, excluding any discounts offered. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the Bid.

14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Price Bid, in accordance with ITB 12.1.

14.5 Unless otherwise provided in the BDS and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indexes and weightings for the price adjustment formulas in the Table(s) of Adjustment Data in Section 4 (Bidding Forms) and the Employer may require the Bidder to justify its proposed indexes and weightings.

14.6 If so indicated in ITB 1.1, bids are being invited for individual contracts or for any combination of contracts (packages). Bidders wishing to offer any price reduction 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. Price reductions or discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all contracts are submitted and opened at the same time.

14.7 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 payment 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 appropriate form(s) of Section 4, 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 4 (Bidding Forms), in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.

17. Documents Establishing the Qualifications of the Bidder

17.1 To establish its qualifications to perform the Contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding information sheets included in Section 4 (Bidding Forms).

17.2 Domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility in accordance with ITB 35.

18. Period of Validity of Bids

18.1 Bids shall remain valid for the period specified in the BDS after the bid submission deadline date prescribed by the Employer. A bid valid for a shorter period shall be rejected by the Employer as nonresponsive.

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 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.

19. Bid Security/Bid-Securing Declaration

19.1 Unless otherwise specified in the BDS, the Bidder shall furnish as part of its Bid, in original form, either a Bid-Securing Declaration or a bid security as specified in the BDS. In the case of a bid security, the amount and currency shall be as specified in the BDS.

19.2 If a Bid-Securing Declaration is required pursuant to ITB 19.1, it shall use the form included in Section 4 (Bidding Forms). The Employer will declare a Bidder ineligible to be awarded a Contract for a specified period of time, as indicated in the BDS, if the Bid-Securing Declaration is executed.

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

(a) an unconditional bank guarantee,

(b) an irrevocable letter of credit, or

(c) a cashier's or certified check,

all from a reputable bank from an eligible country as described in Section 5 (Eligible Countries). In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included

in Section 4 (Bidding Forms) or another form acceptable to the Employer. The form must include the complete name of the Bidder. The bid security shall be valid for 28 days beyond the original validity period of the bid, or beyond any period of extension if requested under ITB 18.2.

19.4 Unless otherwise specified in the BDS, any Bid not accompanied by a substantially compliant bid security or Bid-Securing Declaration, if one is required in accordance with ITB 19.1, shall be rejected by the Employer as nonresponsive.

19.5 If a bid security is specified pursuant to ITB 19.1, the bid security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's furnishing of the performance security pursuant to ITB 42.

19.6 If a bid security is specified pursuant to ITB 19.1, 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 Letters of Technical Bid and Price Bid, except as provided in ITB 18.2; or

(b) if the successful Bidder fails to

(i) sign the Contract in accordance with ITB 41;

(ii) furnish a performance security in accordance with ITB 42;

(iii) accept arithmetical corrections in accordance with ITB 33; or

(iv) furnish a domestic preference security, if applicable, in accordance with ITB 42.

19.8 The bid security or the Bid-Securing Declaration of a Joint Venture shall be in the name of the Joint Venture that submits the Bid. If the Joint Venture has not been legally constituted at the time of bidding, the bid security or the Bid-Securing Declaration shall be in the names of all future partners as named in the letter of intent mentioned in ITB 4.1.

20. Format and Signing of Bid

20.1 The Bidder shall prepare one original set of the Technical Bid and one original of the Price Bid comprising the Bid as described in ITB 11 and clearly mark it "ORIGINAL - TECHNICAL BID" and "ORIGINAL - PRICE BID." Alternative Bids, if permitted in accordance with ITB 13, shall be clearly marked "ALTERNATIVE." In addition, the Bidder shall submit copies of the Bid in the number specified in the BDS**,** and clearly mark each of them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

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, except for unamended printed literature, shall be signed or initialed by the person signing the bid. If a Bidder submits a deficient authorization, the Bid shall not be rejected in the first instance. The Employer shall request the Bidder to submit an acceptable authorization within the number of days as specified in the BDS. Failure to provide an acceptable authorization within the prescribed period of receiving such a request shall cause the rejection of the Bid.

20.3 Any amendments such as interlineations, 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

21. Sealing and Marking of Bids

21.1 Bidders may always submit their Bids by mail or by hand. When so specified in the BDS, Bidders shall have the option of submitting their Bids electronically. Procedures for submission, sealing, and marking are as follows:

(a) Bidders submitting Bids by mail or by hand shall enclose the original of the Technical Bid, the original of the Price Bid, and each copy of the Technical Bid and each copy of the Price Bid, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL - TECHNICAL BID," "ORIGINAL - PRICE BID," and "COPY NO… - TECHNICAL BID," and "COPY NO…. - PRICE BID." These envelopes, the first containing the originals and the others containing copies, shall then be enclosed in one single envelope per set. If permitted in accordance with ITB 13, alternative Bids shall be similarly sealed, marked and included in the sets. The rest of the procedure shall be in accordance with ITB 21.2 and ITB 21.3.

(b) Bidders submitting Bids electronically shall follow the electronic bid submission procedures specified in the BDS.

21.2 The inner and outer envelopes shall

(a) bear the name and address of the Bidder;

(b) be addressed to the Employer as provided in BDS 22.1; and

(c) bear the specific identification of this bidding process indicated in the BDS 1.1.

21.3 The outer envelopes and the inner envelopes containing the Technical Bid shall bear a warning not to open before the time and date for the opening of Technical Bid, in accordance with ITB 25.1.

21.4 The inner envelopes containing the Price Bid shall bear a warning not to open until advised by the Employer in accordance with ITB 25.7.

21.5 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 indicated in the BDS.

22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Document 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.

24. Withdrawal, Substitution, and Modification of Bids

24.1 A Bidder may withdraw, substitute, or modify its Bid – Technical or Price – 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, (except that withdrawal notices do not require copies). 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 withdrawal 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 Letters of Technical Bid and Price Bid or any extension thereof.

25. Bid Opening

25.1 The Employer shall open the Technical Bids in public at the address, on the date, and time 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 21.1, shall be as specified in the BDS. The Price Bids will remain unopened and will be held in custody of the Employer until the specified time of their opening. If the Technical Bid and Price Bid are submitted together in one envelope, the Employer may reject the entire Bid. Alternatively, the Price Bid may be immediately resealed for later evaluation.

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.

25.3 Second, outer envelopes marked “SUBSTITUTION” shall be opened. The inner envelopes containing the Substitution Technical Bid and/or Substitution Price Bid shall be exchanged for the corresponding envelopes being substituted, which are to be returned to the Bidder unopened. Only the Substitution Technical Bid, if any, shall be opened, read out, and recorded. Substitution Price Bid will remain unopened in accordance with ITB 25.1. No envelope shall be substituted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out and recorded at bid opening.

25.4 Next, outer envelopes marked “MODIFICATION” shall be opened. No Technical Bid and/or Price Bid shall be modified unless the corresponding modification notice contains a valid authorization to request the modification and is read out and recorded at the opening of Technical Bids. Only the Technical Bids, both Original as well as Modification, are to be opened, read out, and recorded at the opening. Price Bids, both Original and Modification, will remain unopened in accordance with ITB 25.1.

25.5 All other envelopes holding the Technical Bids shall be opened one at a time, and the following read out and recorded:

(a) the name of the Bidder;

(b) whether there is a modification or substitution;

(c) the presence of a bid security or a Bid-Securing Declaration, if required; and

(d) any other details as the Employer may consider appropriate.

Only Technical Bids and alternative Technical Bids read out and recorded at bid opening shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Technical Bid are to be initialed by at least three representatives of the Employer attending the bid opening. No Bid shall be rejected at the opening of Technical Bids except for late bids, in accordance with ITB 23.1.

25.6 The Employer shall prepare a record of the opening of Technical Bids that shall include, as a minimum, the name of the Bidder and whether there is a withdrawal, substitution, or modification; alternative proposals; and the presence or absence of a bid security or a Bid-Securing Declaration, if one was required. 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 who submitted Bids on time, and posted online when electronic bidding is permitted.

25.7 At the end of the evaluation of the Technical Bids, the Employer will invite bidders who have submitted substantially responsive Technical Bids and who have been determined as being qualified for award to attend the opening of the Price Bids. The date, time, and location of the opening of Price Bids will be advised in writing by the Employer. Bidders shall be given reasonable notice for the opening of Price Bids.

25.8 The Employer will notify Bidders in writing who have been rejected on the grounds of their Technical Bids being substantially nonresponsive to the requirements of the Bidding Document and return their Price Bids unopened.

25.9 The Employer shall conduct the opening of Price Bids of all Bidders who submitted substantially responsive Technical Bids, in the presence of Bidders` representatives who choose to attend at the address, on the date, and time specified by the Employer. The Bidder's representatives who are present shall be requested to sign a register evidencing their attendance.

25.10 All envelopes containing Price Bids shall be opened one at a time and the following read out and recorded:

(a) the name of the Bidder;

(b) whether there is a modification or substitution;

(c) the Bid Prices, including any discounts and alternative offers; and

(d) any other details as the Employer may consider appropriate.

Only Price Bids, discounts, and alternative offers read out and recorded during the opening of Price Bids shall be considered for evaluation. Unless otherwise specified in the BDS, all pages of the Letter of Price Bid and Schedules are to be initialed by at least three representatives of the Employer attending the bid opening.No Bid shall be rejected at the opening of Price Bids.

25.11 The Employer shall prepare a record of the opening of Price Bids that shall include, as a minimum, the name of the Bidder, the Bid Price (per lot if applicable), any discounts, and alternative offers. 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 who submitted Bids on time, and posted online when electronic bidding is permitted.

E. Evaluation and Comparison of Bids

26. Confidentiality

26.1 Information relating to the examination, evaluation, comparison, and postqualification of Bids and recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process until information on Contract award is communicated to all Bidders.

26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the Bids 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 any Bidder wishes to contact the Employer on any matter related to the bidding process, it may do so in writing.

27. Clarification of

27.1 To assist in the examination, evaluation, and comparison of the Technical and Price Bids, the Employer may, at its discretion, ask any

Bids

Bidder for a clarification of its Bid. 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 in the substance of the Technical Bid or prices in the Price Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Price Bids, in accordance with ITB 33.

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 Document;

(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and

(c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

29. Examination of Technical Bids

29.1 The Employer shall examine the Technical Bid to confirm that all documents and technical documentation requested in ITB 11.2 have been provided, and to determine the completeness of each document submitted.

29.2 The Employer shall confirm that the following documents and information have been provided in the Technical Bid. If any of these documents or information is missing, the offer shall be rejected.

(a) Letter of Technical Bid;

(b) written confirmation of authorization to commit the Bidder;

(c) Bid Security or Bid-Securing Declaration, if applicable; and

(d) Technical Proposal in accordance with ITB 16.

30. Responsiveness of Technical Bid

30.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB 11.

30.2 A substantially responsive Technical Bid is one that meets the requirements of the Bidding Document 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 Document, 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.

30.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 16, Technical Proposal, in particular, to confirm that all requirements of Section 6 (Employer's Requirements) have been met without any material deviation, reservation, or omission.

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

31. Nonmaterial Nonconformities

31.1 Provided that a Bid is substantially responsive, the Employer may waive any nonconformities in the Bid that do not constitute a material deviation, reservation, or omission.

31.2 Provided that a Technical 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 Technical Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the Price Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

31.3 Provided that a Technical 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. The adjustment shall be made using the method indicated in Section 3 (Evaluation and Qualification Criteria).

32. Qualification of the Bidder

32.1 The Employer shall determine to its satisfaction during the evaluation of Technical Bids whether Bidders meet the qualifying criteria specified in Section 3 (Evaluation and Qualification Criteria).

32.2 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.

32.3 An affirmative determination shall be a prerequisite for the opening and evaluation of a Bidder's Price Bid. A negative determination shall result into the disqualification of the Bid, in which event the Employer shall return the unopened Price Bid to the Bidder.

33. Correction of Arithmetical Errors

33.1 During the evaluation of Price Bids, the Employer shall correct arithmetical errors on the following basis:

(a) Only for unit price 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) 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.

(c) If there is a discrepancy between the bid price in the Summary of Bill of Quantities and the bid amount in item (c) of the Letter of Price Bid, the bid price in the Summary of Bill of Quantities will prevail and the bid amount in item (c) of the Letter of Price Bid will be corrected.

(d) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a), (b) and (c) above.

33.2 If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its Bid shall be disqualified and its bid security may be forfeited or its Bid-Securing Declaration executed.

34. Conversion to Single Currency

34.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.

35. Margin of Preference

35.1 Unless otherwise specified in the BDS, a margin of preference shall not apply.

36. Evaluation of Price Bids

36.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

36.2 To evaluate the Price Bid, the Employer shall consider the following:

(a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts, or Schedule of Prices for lump sum contracts, but including Daywork items, where priced competitively;

(b) price adjustment for correction of arithmetic errors in accordance with ITB 33.1;

(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 34;

(e) adjustment for nonconformities in accordance with ITB 31.3; and

(f) application of all the evaluation factors indicated in Section 3 (Evaluation and Qualification Criteria).

36.3 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.

36.4 If this Bidding Document allows Bidders to quote separate prices for different contracts, and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discounts offered in the Letter of Price Bid, is specified in Section 3 (Evaluation and Qualification Criteria).

36.5 If the Bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

37. Comparison of Bids

37.1 The Employer shall compare all substantially responsive Bids to determine the lowest evaluated Bid, in accordance with ITB 36.2.

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 The Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated Bid and is substantially responsive to the Bidding Document, 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.

40.2 At the same time, the Employer shall also notify all other Bidders of the results of the bidding. The Employer will publish in an English language newspaper or well-known freely accessible website the results identifying the bid and lot numbers and the following information: (i) name of each Bidder who submitted a Bid; (ii) bid prices as read out at bid opening; (iii) name and evaluated prices of each Bid that was evaluated; (iv) name of bidders whose bids were rejected and the reasons for their rejection; and (v) name of the winning Bidder, and the price it offered, as well as the duration and summary scope of the contract awarded. After publication of the award, unsuccessful Bidders may request in writing to the Employer for a debriefing seeking explanations on the grounds on which their Bids were not selected. The Employer shall promptly respond in writing to any unsuccessful Bidder who, after publication of contract award, requests a debriefing.

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

41. Signing of Contract

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

41.2 Within 28 days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

42. Performance Security

42.1 Within 28 days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the Conditions of Contract, subject to ITB 36.5, using for that purpose the Performance Security Form included in Section 9 (Contract Forms), or another form acceptable to the Employer.

42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement 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.

42.3 The above provision shall also apply to the furnishing of a domestic preference security, if so required.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 2 - Bid Data Sheet (BDS)

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

Section 2 - Bid Data Sheet

A. General

ITB 1.1	The number of the Invitation for Bids (IFB) is JP/EW/1B/JFT-1
	The Employer is : JAIPUR METRO RAIL CORPORATION LTD. Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) India, PIN-302005
	The name of the bidding process is : National Competitive Bidding (NCB) The Name of the NCB : Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India The identification number of the bidding process is : NCB No.- JP/EW/1B/JFT-1 The number and identification of lots comprising this bidding process is : One
ITB 2.1	The Borrower is: INDIA The name of the Project is: Jaipur Metro Rail Project (Phase -1B) INDIA has received financing from the Asian Development Bank (ADB) toward the cost of Jaipur Metro Rail Line 1-Phase B Project. Part of this financing will be used for payments under the Contract named above. Bidding is open to Bidders from eligible source countries of the ADB

B. Contents of Bidding Documents

ITB 7.1	For **clarification purposes** only, the Employer's address is: Attention: Mr. Ashwani Saxena, Director (Project) Jaipur Metro Rail Corporation Limited, 3rd Floor, RSIC building, Udyog Bhawan, Tilak Marg, C-Scheme, Jaipur, Rajasthan, India PIN - 302 005 Telephone: +91-141-5192 450, 455,458 Facsimile number: +91-141-5192 451 Electronic mail address: jmrctracktender1b@gmail.com Requests for clarification should be received by the Employer no later than:7 days

ITB 7.4	A Pre-Bid meeting shall take place. Date: 06.12.2016 Time: 15:00 hrs Place: Jaipur Metro Rail Corporation Limited, 3rd Floor, RSIC building, Udyog Bhawan, Tilak Marg, C-Scheme, Jaipur, Rajasthan, India PIN - 302 005 A site visit by the Employer will be conducted on the request of bidder.

C. Preparation of Bids

ITB 10.1	The language of the Bid is: English
ITB 11.2 (g)	In accordance with ITB 12 and ITB 14, the schedules shall be submitted with the bid, including the priced Bill of Quantities for admeasurements contracts. The Bidder shall submit with its Technical Bid with the following additional documents: i Tender index: The bidder shall include with its bid an index which cross refers all of the employers requirements elaborated in these documents to all the individual sections within this bid for the technical package. The bid package must be clearly presented, all pages number and aid out in a logical sequence with main and sub headings to facilitate evaluation.
ITB 11.3 (d)	The Bidder shall submit with its Price Bid with the following additional documents: i Tender index: The bidder shall include with its bid an index which cross refers all of the employers requirements elaborated in these documents to all the individual sections within this bid for the financial package. The bid package must be clearly presented, all pages number and aid out in a logical sequence with main and sub headings to facilitate evaluation.
ITB 12.1	***[For admeasurement contracts:]*** The units and rates in figures entered into the Bill of Quantities and Day work Schedule should be typewritten or if written by hand, must be in print form. Bill of Quantities and Day work Schedule not presented accordingly may be considered nonresponsive.
ITB 13.1	Alternative bids shall not be permitted.
ITB 13.2	Alternative times for completion shall not be permitted.
ITB 13.4	Alternative technical solution shall not be permitted.

ITB 14.5	The price quoted by the bidder shall be fixed.
ITB 15.1	The currencies of the Bid shall be as follows: (a) The price shall be quoted either in the currency of the Bidder's home country, or in any fully convertible currency of up to three foreign currencies. (b) A Bidder expecting to incur a portion of its expenditures in the performance of the Contract in more than one currency, and wishing to be paid accordingly, shall so indicate in the Schedule of Prices and the Letter of Price Bid. (c) If some of the contract expenditures related to Design, Installation and Other Services are to be incurred in the Employer's country, such expenditures shall be quoted in either foreign and/or local currency, depending upon the currency in which the costs are to be incurred. (d) Bidders may be required by the Employer to clarify their local and foreign currency requirements, and to substantiate that the amounts included in the Price Schedules are reasonable and responsive to ITB 18.1 in which case a detailed breakdown of its foreign currency requirements shall be provided by the Bidder. (e) During the performance of the contract, the foreign currency portions of the outstanding balance of the Contract Price may be adjusted by agreement between the Employer and the Contractor to reflect any changes in foreign currency requirements for the contract. Any such adjustment shall be effected by comparing the amounts quoted in the bid with the amounts already used in the Facilities and the Contractor's future needs for imported items.
ITB 18.1	The bid validity period shall be 120 days.
ITB 19.1	The Bidder shall furnish a bid security in the amount of INR 56.54 lakhs (Fifty six lakhs and fifty four thousands).
ITB 19.2	The ineligibility period will be: - Not applicable
ITB 19.4	Any bid not accompanied by an irrevocable and callable bid security shall be rejected by the Employer as nonresponsive. However, if a bidder submits a bid security that deviates in form, and/or period of validity, the Employer shall request the Bidder to submit a compliant bid security within 14 *days* of receiving such a request. Failure to provide a compliant bid security within the prescribed period of receiving such a request shall cause the rejection of the Bid.
ITB 20.1	In addition to the original Bid, the number of copies is:- Two
ITB 20.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of : - "An organizational document, board resolution or its equivalent, or power of attorney specifying the representative's authority to sign the Bid on behalf of, and to legally bind, the Bidder. If the Bidder is an intended or an existing joint venture, the power of attorney should be signed by all partners and specify the authority of the named representative of the Joint Venture to sign on behalf of, and legally

	bind, the intended or existing Joint Venture. If the Joint Venture has not yet been formed, also include evidence from all proposed Joint Venture partners of their intent to enter into a Joint Venture in the event of a contract award in accordance with ITB11.2"
ITB 20.2	The Bidder shall submit an acceptable authorization within 14 days.

D. Submission and Opening of Bids

ITB 21.1	Bidders shall not have the option of submitting their Bids electronically.
ITB 21.1 (b)	Bidders shall not have the option of submitting their Bids electronically.
ITB 22.1	For **bid submission purposes** only, the Employer's address is: Attention: Mr. Ashwani Saxena, Director (Project) Jaipur Metro Rail Corporation Limited, 3rd Floor, RSIC building, Udyog Bhawan, Tilak Marg, C-Scheme, Jaipur, Rajasthan, India PIN - 302 005 **The deadline for bid submission is:** Date: 04.01.2017 Time: 15:00 hrs
ITB 25.1	The opening of the Technical Bid shall take place at: Jaipur Metro Rail Corporation Limited, 3rd Floor, RSIC building, Udyog Bhawan, Tilak Marg, C-Scheme, Jaipur, Rajasthan, India PIN - 302 005 Date: 04.01.2017 Time: Immediately after the deadline for bid submission.
ITB 25.1	Bidders shall not have the option of submitting their Bids electronically.

E. Evaluation and Comparison of Bids

ITB 34.1	The currency that shall be used for bid evaluation and comparison purpose to convert all bid prices expressed in various currencies into a single currency is: Indian Rupee (INR). The source of the selling exchange rate shall be: Reserve Bank of India. The date for the selling exchange rate shall be: 28 days prior to the deadline for submission of the Bids.
ITB 35.1	A margin of preference shall not apply.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 3 - Evaluation and Qualification Criteria (EQC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

Section 3 - Evaluation and Qualification Criteria

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1. Evaluation

In addition to the criteria listed in ITB 36.2 (a) – (e), other relevant factors are as follows:

1.1 Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section 6 (Employer's Requirements).

Non-compliance with equipment and personnel requirements described in Section 6 (Employer's Requirements) shall not normally be a ground for bid rejection, and such noncompliance will be subject to clarification during bid evaluation and rectification prior to contract award.

1.2 Completion Time

An alternative Completion Time, if permitted under ITB 13.2, will be evaluated as follows:N/A

1.3 Technical Alternatives

Technical alternatives, if permitted under ITB 13.4, will be evaluated as follows: N/A

1.4 Quantifiable Nonconformities and Omissions

Subject to ITB 14.2 and ITB 36.2, the evaluated cost of quantifiable nonconformities including omissions, is determined as follows: N/A

1.5 Margin of Preference (Applicable for ICB only)

If a margin of preference shall apply under ITB 35.1, the procedure will be as follows as: N/A

1.6 **Multiple Contracts:** Not Applicable

2. Qualification

It is the legal entity or entities comprising the Bidder, and not the Bidder's parent companies, subsidiaries, or affiliates, that must satisfy the qualification criteria described below.

2.1 Eligibility

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
2.1.1 Nationality					
Nationality in accordance with ITB Sub clause 4.2.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI –1; ELI –2 with attachments
2.1.2 Conflict of Interest					
No conflicts of interest in accordance with ITB Sub clause 4.3.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
2.1.3 ADB Eligibility					
Not having been declared ineligible by ADB, as described in ITB Sub clause 4.4.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid
2.1.4 Government-Owned Enterprise					
Bidder required to meet conditions of ITB Sub clause 4.5.	must meet requirement	must meet requirement	must meet requirement	not applicable	Forms ELI -1, ELI - 2 with attachments
2.1.5 United Nations Eligibility					
Not having been excluded by an act of compliance with a UN Security Council resolution in accordance with ITB Sub clause 4.7.	must meet requirement	must meet requirement	must meet requirement	not applicable	Letter of Technical Bid

2.2 Pending Litigation

Pending litigation and arbitration criterion shall apply.

2.2.1 Pending Litigation and Arbitration

Requirement	**Single Entity**	**Joint Venture**			**Submission Requirements**
		All Partners Combined	**Each Partner**	**One Partner**	
All pending litigation and arbitration, if any, shall be treated as resolved against the Bidder and so shall in total not represent more than 60 percent of the Bidder's net worth calculated as the difference between total assets and total liabilities.	must meet requirement by itself or as partner to past or existing Joint Venture	not applicable	must meet requirement by itself or as partner to past or existing Joint Venture	not applicable	Form LIT - 1

2.3 Financial Situation

2.3.1 Historical Financial Performance

Criteria	**Compliance Requirements**				**Documents**
Requirement	**Single Entity**	**Joint Venture**			**Submission Requirements**
		All Partners Combined	**Each Partner**	**One Partner**	
Submission of audited financial statements or, if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, for the last three years to demonstrate the current soundness of the Bidder's financial position. As a minimum, the Bidder's net worth for the last year, calculated as the difference between total assets and total liabilities should be positive.	must meet requirement	not applicable	must meet requirement	not applicable	Form FIN - 1 with attachments

2.3.2 Average Annual Construction Turnover

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
Minimum average annual construction turnover should be more than of INR 56.54 crore, calculated as total certified payments received for contracts in progress or completed, within the last three years.	must meet requirement	must meet requirement	must meet 25 % of the requirement	must meet 40 % of the requirement	Form FIN - 2

2.3.3 Financial Resources

If the bid evaluation process and the decision for the award of the Contract takes more than one (1) year from the date of bid submission, Bidders shall be asked to resubmit their current contract commitments and latest information on financial resources supported by latest audited accounts/audited financial statements, or if not required by the law of the Bidder's country, other financial statements acceptable to the Employer, and the Bidders' financial capacity shall be reassessed on this basis.

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
The Bidder must demonstrate that it has the financial resources to meet	Not applicable	not applicable	not applicable	not applicable	
(a) its current contract commitments, as defined in FIN-4 (Total Financial Requirements for Current Contract Commitments), plus	must meet requirement	not applicable	must meet requirement for its own contractual commitments	not applicable	Form FIN - 4
(b) the requirements for the Subject Contract of INR 7.07 crores.	must meet requirement	must meet requirement	must meet 25% of the requirement	must meet 40% of the requirement	Form FIN – 3 and Form FIN - 4

Note –

1. The entries made under clause 2.3.2 and 2.3.3 and Section-4 (FIN-1 to FIN-5) shall have cross references to submitted financial statements.
2. Financial Statements FIN-1 to FIN-4 should also be certified by Chartered Accountant.

2.4 Construction Experience

2.4.1 Contracts of Similar Size and Nature

Criteria	Compliance Requirements				Documents
Requirement	**Single Entity**	**Joint Venture**			**Submission Requirements**
		All Partners Combined	**Each Partner**	**One Partner**	
Participation in at least **one contract** that has been successfully or substantially completed within the last seven years and that is similar to the proposed works, where the value of the Bidder's participation exceeds at least **INR 22.62 crore**. The similarity of the Bidder's participation shall be based on the physical size, nature of works, complexity, methods, technology or other characteristics as described in Section 6 (Employer's Requirements).	Must meet requirement	must meet requirement	Not applicable	must meet requirement	Form EXP -1

OR

Criteria	Compliance Requirements				Documents
Requirement	**Single Entity**	**Joint Venture**			**Submission Requirements**
		All Partners Combined	**Each Partner**	**One Partner**	
Participation in at least two contracts that have been successfully or substantially completed within the last seven years and that are similar to the proposed works, where the value of the Bidder's participation exceeds at least INR 22.62 crore. The similarity of the Bidder's participation shall be based on the physical size, nature of works, complexity, methods, technology or other characteristics as described in Section 6 (Employer's Requirements).	Must meet requirement	must meet requirement as follows: Either one partner must meet requirement or any two partners must each demonstrate one (1) successfully or substantially completed contract of similar size and nature.	Not applicable	Not applicable	Form EXP -1

2.4.2 Construction Experience in Key Activities

(May be complied with by specialist subcontractors. Employer shall require evidence of subcontracting agreement from the Bidder. A specialist subcontractor is a specialist enterprise engaged for highly specialized processes, which the main contractor cannot provide.)

Criteria	Compliance Requirements				Documents
Requirement	Single Entity	Joint Venture			Submission Requirements
		All Partners Combined	Each Partner	One Partner	
For the above or other contracts executed during the period stipulated in 2.4.1 above, a minimum construction experience in the following key activities: Contract shall have the experience for the work of installation of ballasted /ballastless track work on MRTS or main lines of passenger Railway Systems including High Speed Rail System including installation of ballastless track for a minimum length of 2 km. In case of double/multiple line, each line will be counted separately. The experience of installation of tracks on a system having design axle load less than 12 Tons, or portions of work having design speed less than 70 Kmph or Tramways shall not be considered. Components of ballastless track works in sidings, spurs and other non-passenger portions shall also not be considered.	Must meet requirements	Must meet requirements[a]	Not applicable	Not applicable	Form EXP-2

[a] In the case of a joint venture bidder, at least one of the partners must have the experience in the key activity if the bidder itself (not its subcontractor) will carry out the relevant activity.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 4 – Bidding Forms (BDF) – Vol. I

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

Section 4 - Bidding Forms

This section contains the forms to be completed by the Bidder and submitted as part of its Bid.

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Letter of Technical Bid

-Note-

The bidder must accomplish the Letter of Technical Bid on its letterhead clearly showing the bidder's complete name and address.

Date: .....

NCB No**.: JP/EW/1B/JFT-1**

Invitation for Bid No.**JP/EW/1B/JFT-1**

To:

Chairman and Managing Director
Jaipur Metro Rail Corporation Ltd.
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan)
INDIA, PIN -302005

NCB No.:- JP/EW/1B/JFT-1: Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.

(b) We offer to execute in conformity with the Bidding Documents the following Works:

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

(c) Our Bid consisting of the Technical Bid and the Price Bid shall be valid for a period of 120 days 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.

(d) Our firm, including any Subcontractors or Suppliers for any part of the Contract, have nationalities from eligible countries in accordance with ITB 4.2.

(e) We, including any Subcontractors or Suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 4.3.

(f) We are not participating, as a Bidder in more than one Bid in this bidding process in accordance with ITB 4.3(e), other than alternative offers submitted in accordance with ITB 13.

(g) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible by ADB, under the Employer's country laws or official regulations or by an act of compliance with a decision of the United Nations Security Council.

(h) [We are not a government-owned enterprise] / [We are a government-owned enterprise but meet the requirements of ITB 4.5].[1]

(i) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.

(j) If our Bid is accepted, we commit to mobilizing key equipment and personnel in accordance with the requirements set forth in Section 6 (Employer's Requirements) and our technical proposal, or as otherwise agreed with the Employer.

Name .....

In the capacity of .....

Signed .....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

[1] Use one of the two options as appropriate.

Letter of Price Bid

-Note-

The bidder must accomplish the Letter of Price Bid on its letterhead clearly showing the bidder's complete name and address.

Date: .....

NCB No**.: JP/EW/1B/JFT-1**

Invitation for Bid No.**JP/EW/1B/JFT-1**

To:

Chairman and Managing Director
Jaipur Metro Rail Corporation Ltd.
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan)
INDIA, PIN -302005

NCB No.:- JP/EW/1B/JFT-1: Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) 8.

(b) We offer to execute in conformity with the Bidding Documents the following Works: Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

(c) The total price of our Bid, excluding any discounts offered in item (d) below is:

[*amount of foreign currency in words*], [*amount in figures*], and [*amount of local currency in words*], [*amount in figures*]

The total bid price from the Summary of Bill of Quantities for admeasurement contracts or Activity Schedule for lump sum contracts should be entered by the bidder inside this box. Absence of the total bid price in the Letter of Price Bid may result in the rejection of the bid.

(d) The discounts offered and the methodology for their application are as follows: _____
_____

(e) Our Bid shall be valid for a period of 120 days 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 the Bidding Documents.

(g) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: [1]

Name of Recipient	Address	Reason	Amount
.....	.....	.....	.....
.....	.....	.....	.....

(h) 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.

(i) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

(j) We agree to permit ADB or its representative to inspect our accounts and records and other documents relating to the bid submission and to have them audited by auditors appointed by ADB.

Name .....

In the capacity of .....

Signed .....

Duly authorized to sign the Bid for and on behalf of .....

Date .....

[1] If none has been paid or is to be paid, indicate “None”.

Bid Security

Bank Guarantee

Bank's name, and address of issuing branch or office[1]

Beneficiary: ..... *Name and address of employer* .....

Date:.....

Bid Security No.:.....

We have been informed that . . . . . *name of the bidder.* . . . . (hereinafter called "the Bidder") has submitted to you its bid dated . . . . . (hereinafter called "the Bid") for the execution of . . . . . *name of contract* . . . . . under Invitation for Bids No. . . . . (“the IFB”).

Furthermore, we understand that, according to your conditions, bids must be supported by a bid guarantee.

At the request of the Bidder, we . . . . . *name of bank.* . . . . hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *.amount in figures* . . . . . (. . . . . *.amount in words* . . . . .)upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the bid conditions, because the Bidder

(a) has withdrawn its Bid during the period of bid validity specified by the Bidder in the Letter of Technical Bid and Letter of Price Bid; or

(b) does 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 its Bid by the Employer during the period of bid validity, (i) fails or refuses to execute the Contract Agreement, or (ii) fails or refuses to furnish the Performance Security, in accordance with the ITB, or (iii) fails or refuses to furnish the domestic preference security, if required.

This guarantee will expire (a) if the Bidder is the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; and (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy your notification to the Bidder of the name of the successful Bidder, or (ii) 28 days after the expiration of the Bidder’s bid.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458.[2]

. . . . . *.Bank's seal and authorized signature(s)* . . . . . .

-- Note --

In case of a joint venture, the bid security must be in the name of all partners to the joint venture that submits the bid.

[1] All italicized text is for use in preparing this form and shall be deleted from the final document.

[2] Or 758 as applicable.

Bid-Securing Declaration

(Not Applicable)

Technical Proposal

Personnel

Form PER – 1: Proposed Personnel

Bidder should provide the details of the proposed personnel and their experience record in the relevant Information Forms below for each candidate:

1.	**Title of position***
	Name
2.	**Title of position***
	Name
3.	**Title of position***
	Name
4.	**Title of position***
	Name
etc.	**Title of position***
	Name

-- Note --

**As listed in Section 6 (Employer's Requirements).*

Form PER – 2: Resume of Proposed Personnel

The Bidder shall provide all the information requested below. Use one form for each position.

Position		
Personnel information	**Name**	**Date of birth**
	Professional qualifications	
Present employment	**Name of employer**	
	Address of employer	
	Telephone	**Contact (manager / personnel officer)**
	Fax	**E-mail**
	Job title	**Years with present employer**

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company / Project / Position / Relevant Technical and Management Experience

Equipment

Form EQU: Equipment

The Bidder shall provide adequate information and details to demonstrate clearly that it has the capability to meet the equipment requirements indicated in Section 6 (Employer's Requirements), using the Forms below. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder.

Item of Equipment		
Equipment Information	**Name of manufacturer**	**Model and power rating**
	Capacity	**Year of manufacture**
Current Status	**Current location**	
	Details of current commitments	
Source	**Indicate source of the equipment** ☐ **Owned** ☐ **Rented** ☐ **Leased** ☐ **Specially manufactured**	

Omit the following information for equipment owned by the Bidder.

Owner	**Name of owner**	
	Address of owner	
	Telephone	**Contact name and title**
	Fax	**Telex**
Agreements	**Details of rental / lease / manufacture agreements specific to the project**	

TECHNICAL PROPOSAL / DETAILS TO BE SUBMITTED BY TENDERERS AS A PART OF THE TECHNICAL PACKAGE

1. Proposal for asymmetrical thick webbed section for tongue rail.
2. Proposal /arrangements of the supplier for integrating the turnouts in LWR / CWR to demonstrate the adequacy of the arrangements for the purpose, the design rail temperature range (-) 10 degree Celsius to 70 degree Celsius.
3. Proposed speed potential on various turnouts with basis thereof.
4. Clause by clause confirmation /commentary of all the clauses of technical specifications. Bidder to indicate the length of Stock Rail, Tongue Rail and Crossing of various types of Turnouts to be supplied under this contract along with the schematic drawings showing these details and also the beginning and the end of the turnout curve.
5. Comments /confirmation on full compliance of the provision of IRS-T-12-2009 (with latest amendment) for the rails of 1080 HH grade. Also furnish the values/results obtainable for all the Qualifying Criteria tests mentioned in clause 13 (latest Amendment) of IRS-T-12-2009 for 1080 HH grade rails. For the fatigue test (qualifying criteria test), the values/results obtainable shall be for samples enduring 10 million cycles at a strain of +/- 0.00166.
6. Confirmation for facilities being available with supplier for welding of welded leg extensions to CMS crossings, explosive hardening of CMS crossings, end forging of tongue rail.
7. Confirmation /comments regarding achievement of desired hardness after the end forging of tongue rails.
8. Manufacturing facilities & equipment available with the supplier.
9. Testing facilities available with the supplier.
10. Proposal of packing, handling & shipment to demonstrate that no damage will be caused to the materials during transit.
11. Confirmation regarding 1080 HH rails to be used for manufacture of turnouts, scissors cross-over and derailing switches shall be suitable of being welded by short pre-heat process of Alumino-thermic welding technique as specified in Indian Railway Specification IRS-T-19 (latest version) for Fusion welding of rails by Alumino-Thermic process duly following the provisions of Indian Railway Manual for Alumino-Thermic welding.
12. Any other pertinent technical information /detail, the bidder may like to furnish

Site Organization

Method Statement

Mobilization Schedule

Construction Schedule

Bidders Qualification

To establish its qualifications to perform the contract in accordance with Section 3 (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder.

Form ELI - 1: Bidder's Information Sheet

Bidder's Information	
Bidder's legal name	
In case of Joint Venture, legal name of each partner	
Bidder's country of constitution	
Bidder's year of constitution	
Bidder's legal address in country of constitution	
Bidder's authorized representative (name, address, telephone numbers, fax numbers, e-mail address)	

Attached are copies of the following documents.

- ❑ 1. In case of single entity, articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2.
- ❑ 2. Authorization to represent the firm or Joint Venture named above, in accordance with ITB 20.2.
- ❑ 3. In case of Joint Venture, letter of intent to form Joint Venture or Joint Venture agreement, in accordance with ITB 4.1.
- ❑ 4. In case of a government-owned enterprise, any additional documents not covered under 1 above required to comply with ITB 4.5.

Form ELI - 2: Joint Venture Information Sheet

Each member of the Joint Venture and Specialist Subcontractor must fill out this form separately.

Joint Venture / Specialist Subcontractor Information	
Bidder's legal name	
Joint Venture Partner's or Specialist Subcontractor's legal name	
Joint Venture Partner's or Specialist Subcontractor's country of constitution	
Joint Venture Partner's or Specialist Subcontractor's year of constitution	
Joint Venture Partner's or Specialist Subcontractor's legal address in country of constitution	
Joint Venture Partner's or Specialist Subcontractor's authorized representative information (name, address, telephone numbers, fax numbers, e-mail address)	
Attached are copies of the following documents. ❑ 1. Articles of incorporation or constitution of the legal entity named above, in accordance with ITB 4.1 and ITB 4.2. ❑ 2. Authorization to represent the firm named above, in accordance with ITB 20.2. ❑ 3. In the case of government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5.	

Specialist Subcontractor is a specialist enterprise engaged for highly specialized processes that cannot be provided by the main Contractor.

Form LIT – 1: Pending Litigation and Arbitration

Each Bidder must fill out this form if so required under Criterion 2.2 of Section 3 (Evaluation and Qualification Criteria) to describe any pending litigation or arbitration formally commenced against it.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

Pending Litigation and Arbitration

Choose one of the following:

❑ No pending litigation and arbitration.

❑ Below is a description of all pending litigation and arbitration involving the Bidder (or each Joint Venture member if Bidder is a Joint Venture).

Year	Matter in Dispute	Value of Pending Claim in US$ Equivalent	Value of Pending Claim as a Percentage of Net Worth

- Note -

This form shall only be included if Criterion 2.2 of Section 3 (Evaluation and Qualification Criteria) is applicable.

Form FIN - 1: Historical Financial Performance

Each Bidder must fill out this form.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

Financial Data for Previous 3 Years [INR Equivalent]		
Year 1:	**Year 2:**	**Year 3:**

Information from Balance Sheet

Total Assets (TA)			
Total Liabilities (TL)			
Net Worth = TA – TL			
Current Assets (CA)			
Current Liabilities (CL)			
Working Capital = CA - CL			

Most Recent Working Capital		To be obtained for most recent year and carried forward to FIN-3 Line 1; in case of Joint Ventures, to the corresponding Joint Venture Partner's FIN-3.

Information from Income Statement

Total Revenues			
Profits Before Taxes			
Profits After Taxes			

❑ Attached are copies of financial statements (balance sheets including all related notes, and income statements) for the last _____ years, as indicated above, complying with the following conditions.

- Unless otherwise required by Section 3 of the Bidding Document, all such documents reflect the financial situation of legal entity or entities comprising the Bidder and not the Bidder's parent companies, subsidiaries, or affiliates.
- Historical financial statements must be audited by a certified accountant.
- Historical financial statements must be complete, including all notes to the financial statements.
- Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

Form FIN - 2: Average Annual Construction Turnover

Each Bidder must fill out this form.

The information supplied should be the Annual Turnover of the Bidder or each member of a Joint Venture in terms of the amounts billed to clients for each year for work in progress or completed, converted to US Dollars at the specified exchange rate.

In case of joint ventures, each Joint Venture Partner must fill out this form separately, and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

Annual Turnover Data for the Last 3 Years (Construction only)			
Year	**Amount Currency**	**Exchange Rate**	**US$ Equivalent**
	Average Annual Construction Turnover		

Form FIN – 3: Availability of Financial Resources

Bidder must demonstrate sufficient financial resources, usually comprising of Working Capital supplemented by credit line statements or overdraft facilities and others to meet the Bidder's financial requirements for

(a) its current contract commitments, and

(b) the subject contract.

In case of joint ventures, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

Financial Resources		
No.	**Source of financing**	**Amount (US$ equivalent)**
1	Working Capital (to be taken from FIN-1)	
2	Credit Line[a]	
3	Other Financial Resources	
	Total Available Financial Resources	

[a] *To be substantiated by a letter from the bank issuing the line of credit.*

Form FIN- 4: Financial Resources Requirement

Bidders (or each Joint Venture partner) 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.

In case of joint ventures, each Joint Venture Partner must fill out this form separately and provide the Joint Venture Partner name below:

Joint Venture Partner: _____

Current Contract Commitments						
No.	**Name of Contract**	**Employer's Contact (Address, Tel, Fax)**	**Contract Completion Date**	**Outstanding Contract Value (X)**	**Remaining Contract Period in months (Y)**	**Monthly Financial Resources Requirement (X / Y)**
1						
2						
3						
4						
Total Monthly Financial Requirements for Current Contract Commitments						INR …….

Form FIN - 5: Compliance Check of Financial Resources (Criterion 2.3.3 of Section 3)

Form FIN-5A: For Single Entities

For Single Entities:	Total Available Financial Resources from FIN-3 (C)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN-4 (D)	Available Financial Resources net of CCC (C-D)	≥	Requirement[a]
_____ (Name of Bidder)	_____	_____	_____	≥	100% of Requirement from Section 3 - 2.3.3(b) _____

Form FIN-5B: For Joint Ventures

For Joint Ventures:	Total Available Financial Resources from FIN-3 (C)	Total Monthly Financial Requirement for Current Contract Commitments (CCC) from FIN-4 (D)	Available Financial Resources net of CCC (C-D)	≥	Requirement[a]
One Partner:					
_____ (Name of Partner)	_____	_____	_____	≥	B(%) of Requirement _____
Each (Other) Partner:					
_____ (Name of Partner 1)	_____	_____	_____	≥	A(%) of Requirement _____
_____ (Name of Partner 2)	_____	_____	_____	≥	A(%) of Requirement _____
_____ (Name of Partner 3)	_____	_____	_____	≥	A(%) of Requirement _____
All partners combined			∑ (C-D)[b] = _____	≥	100% of Requirement from Section 3 - 2.3.3(b _____

Form FIN – 5 is made available for use by the bidder as a self-assessment tool, and by the employer as evaluation work sheet, to determine compliance with financial resources.

[a] *Requirement for the subject contract is defined in Criterion 2.3.3(b) of Section 3. Value A is the required percentage of the subject contract, which each partner must meet; and value B is the required percentage of the subject contract, which one partner must meet. A and B values are defined in Criterion 2.3.3 of Section 3 (Evaluation and Qualification Criteria).*

[b] *Σ (C – D) = sum of available financial resources net of current contract commitments (CCC) for all partners.*

Form EXP – 1: Contracts of Similar Size and Nature

Fill up one (1) form per contract.

Contract of Similar Size and Nature		
Contract No . . . . . of	**Contract Identification**	
Award Date		**Completion Date**
Total Contract Amount		**US$**
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	**Percent of Total**	**Amount**
Employer's Name **Address** **Telephone/Fax Number** **E-mail**		
Description of the similarity in accordance with Criterion 2.4.1 of Section 3		
	Contract shall have the experience for the work of installation of ballasted /ballastless track work on MRTS or main lines of passenger Railway Systems including High Speed Rail System including installation of ballastless track for a minimum length of 2 km. In case of double/multiple line, each line will be counted separately. The experience of installation of tracks on a system having design axle load less than 12 Tons, or portions of work having design speed less than 70 Kmph or Tramways shall not be considered. Components of ballastless track works in sidings, spurs and other non-passenger portions shall also not be considered. Note: In case bidder claims experience for a project undertaken as a member of JV, the particular firm's position in the JV needs to be clearly brought out in the clients' certificate or Joint Venture MOU/Agreement.	

Form EXP - 2: Construction Experience in Key Activities

Fill up one (1) form per contract.

Contract with Similar Key Activities		
Contract No . . . . . **of**	**Contract Identification**	
Award Date		**Completion Date**
Total Contract Amount		**US$**
If partner in a Joint Venture or subcontractor, specify participation of total contract amount	**Percent of Total**	**Amount**
Employer's Name **Address** **Telephone Number** **Fax Number** **E-mail**		
Description of the key activities in accordance with Criterion 2.4.2 of Section 3		
	Bidder shall have the experience for the work of installation of ballasted /ballastless track work on MRTS or main lines of passenger Railway Systems including High Speed Rail System including installation of ballastless track for a minimum length of 2 km. In case of double/multiple line, each line will be counted separately. The experience of installation of tracks on a system having design axle load less than 12 Tons, or portions of work having design speed less than 70 Kmph or Tramways shall not be considered. Components of ballastless track works in sidings, spurs and other non-passenger portions shall also not be considered. Note: In case bidder claims experience for a project undertaken as a member of JV, the particular firm's position in the JV needs to be clearly brought out in the clients' certificate or Joint Venture MOU/Agreement.	

Schedules

Schedule of Payment Currencies

For .....*insert name of Section of the Works* .....

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. In such a case, the Employer should prepare separate tables for each Section of the Works.

	A	B	C	D
Name of Payment Currency	**Amount of Currency**	**Rate of Exchange to Local Currency**	**Local Currency Equivalent C = A x B**	**Percentage of Net Bid Price (NBP) 100xC / NBP**
Local Currency		**1.00**		
Foreign Currency #1				
Foreign Currency #2				
Foreign Currency #3				
Net Bid Price				**100.00**
Provisional Sums Expressed in Local Currency		**1.00**		
BID PRICE				

– Note –

The rates of exchange shall be the selling rates 28 days prior to the deadline for submission of bids published by the source specified in BDS 15.

Table(s) of Adjustment Data

DELETED

Table A - Local Currency

Index Code	Index Description	Source of Index *	Base Value and Date	Bidder's Local Currency Amount	Bidder's Proposed Weighting (coefficient)
	Nonadjustable	—	—	—	a: (*by Employer*) b: _____ c: _____ d: _____ e: _____
			Total		**1.00**

Table B - Foreign Currency

Name of Currency: .....

If the Bidder wishes to quote in more than one foreign currency, but in no case more than three, this table should be repeated for each foreign currency.

Index Code	Index Description	Source of Index	Base Value and Date	Bidder's Currency in Type/Amount	Equivalent in FC1	Bidder's Proposed Weighting (coefficient)
	Nonadjustable	—	—	—		a: (by Employer) b: _____ c: _____ d: _____ e: _____
				Total		**1.00**

-- Note --

"Base Date" means the date 28 days prior to the deadline for submission of bids.

Tables of Adjustment Data shall only be included if prices are to be quoted as adjustable prices in accordance with ITB 14.5.

Activity Schedule

[Schedules of Prices – Lump Sum Contract]

The Employer shall indicate the list of major activities comprising the works and the number of measurement units consistent with the description of works, drawings, and specifications in Section 6 (Employer's Requirements). Each work item shall be described in sufficient detail to provide clear guidance to Bidders with respect to the type of works, their scope and complexity, and compliance with the required standards.

Bidders are required to enter the prices against each work item on a lump sum basis. Work items against which no lump sum price is entered by the Bidder will not be paid by the Employer when executed and shall be deemed covered by other work items against which the lump sum prices were entered. The sum of prices entered against each work item will represent the total bid price.

The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the Activity Schedule, and where no Items are provided, the cost shall be deemed to be distributed among the Amounts for the related Items of Work.

Not Applicable

Bill of Quantities
[Admeasurement Contract]

See Section 4 - Vol. - II - Bidding Forms (BDF)
(Schedules of Price)

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 5 - Eligible Countries (ELC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

Section 5 - Eligible Countries

This section contains the list of eligible countries. The list of eligible countries is as under:-

1	Afghanistan	35	Micronesia, Federated States of
2	Armenia	36	Mongolia
3	Australia	37	Myanmar
4	Austria	38	Nauru
5	Azerbaijan	39	Nepal
6	Bangladesh	40	The Netherlands
7	Belgium	41	New Zealand
8	Bhutan	42	Norway
9	Brunei Darussalam	43	Pakistan
10	Cambodia	44	Palau
11	Canada	45	Papua New Guinea
12	China, People's Republic of	46	Philippines
13	Cook Islands	47	Portugal
14	Denmark	48	Samoa
15	Fiji, Republic of	49	Singapore
16	Finland	50	Solomon Islands
17	France	51	Spain
18	Georgia	52	Sri Lanka
19	Germany	53	Sweden
20	Hong Kong, China	54	Switzerland
21	India	55	Taipei, China
22	Indonesia	56	Tajikistan
23	Ireland	57	Thailand
24	Italy	58	Timor- Leste
25	Japan	59	Tonga
26	Kazakhstan	60	Turkey
27	Kiribati	61	Turkmenistan
28	Korea, Republic of	62	Tuvalu
29	Kyrgyz Republic	63	United Kingdom
30	Lao PDR	64	United States
31	Luxemburg	65	Uzbekistan
32	Malaysia	66	Vanuatu
33	Maldives	67	Vietnam
34	Marshall Islands		

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-I BIDDING PROCEDURES

Section 4 – Bidding Forms (BDF) – Vol. II

(Schedules of Prices)

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

Section 4 – Bidding Forms (BDF) – Vol. II

(Schedules of Prices)

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Section 4 –Bidding Forms (BDF)

(Schedules of Price)

Part I – General Principles

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PART 1 – GENERAL PRINCIPLES

SECTION 1 PREAMBLE

1.1 General Requirements

The bidder's attention is drawn to the General Conditions of Contract, Special Conditions of Contract, Employers Requirements and Drawings, which are to be read in conjunction with the Bill of Quantities. This Preamble shall serve as a definitive guide to the measurement of quantities and payment.

The bidder should quote the rates considering that this contract is on Turnkey basis.

This Contract is a re-measurement (unit rate) Contract for Supply, Installation, Testing and Commissioning (including Integrated Testing and Commissioning) of Track Work of East-West Corridor for Phase 1B, and not limited to:

- The construction studies and drawings,
- The supply of P. way material including inspection and testing,
- The arrangements of RDSO approved Flush Butt Welding Machine Equipment, Plant & Machinery for construction activities.
- Installation of temporary arrangement for Track Construction.
- Installation of Track work.
- The commissioning on installation and acceptance protocols
- The supply of relevant documentation mainly including:
  - Installation, execution, and as-built drawings, and
  - Test procedures

1.2 Quantities

For the purpose of this Contact, all unit quantities given in the Bill of Quantities are the estimated quantities of the Works and are intended in the first instance to provide a common basis for Tendering and Tender Evaluation. When a contract has been entered into, the function of priced Bill of Quantities is to provide for the valuation of the work executed. No alteration of any rate or price shall be allowed on account of any difference between the quantities executed and the quantities measured from the drawings.

The bidder shall make himself completely acquainted with all conditions, obligations, specifications, drawings, etc. of the Tender Documents before giving his prices. He shall have no right to claim any price revision on the basis of ignorance of the Tender documents or local conditions, or to make any claims as regards the integrity of the unit prices of the Bill of Quantities.

1.3 Units and Currency

All sizes and quantities entered in the Bill of Quantities are in metric units.

The bidder shall fill in each column with unit rate or lump sum, whichever the case

may be, for each bill item of the various Bills, provided that he should consider it a reimbursable item, on the basis of the Tender Documents and pre-tender survey.

1.3.1 Rates and Sums to be for Work Complete

Bidders shall be deemed to have read the Employer's Requirements and other parts of the Tender Documents and reviewed the Drawings to ascertain the full scope of the requirements included in each item prior to filling in the rates and prices. The entered rates and prices shall be deemed to include for the full scope of the Contract, including overheads and profits and shall bear a proper relationship to the cost of carrying out the work described.

Notwithstanding any limits that maybe implied by the wording of the individual items and/or the explanations in the Preamble, the rates and sums, which the bidder enters in the Bill of Quantities, shall be for the work finished complete in every respect.

The bidder shall be deemed to have taken full account of all requirements, liabilities, obligations and risks, whether expressed or implied, and to have priced the items accordingly. The Items in the Bill of Quantities are the only items against which payment will be made. The cost of any item of work not specifically described or measured in the Bills of Quantities but required for the execution of the Contract shall be allowed for in the unit rates for the measured items in the Bills of Quantities. The rates and sums shall therefore include for all incidental and contingent expenses and risks of every kind necessary to supply, install, test and commission (including Integrated Testing and Commissioning) complete, and remedying any defects in the whole of the Works in accordance with the Contract.

1.3.2 Allowances in rates

Full allowance shall be made in the rates and sums against the various items in the Bills of Quantities for all costs involved including contractors profit, overheads and all type of risk and incidental charges in performing the following except to the extent that work is specifically described and paid for in the Bills of Quantities. The list below is not exhaustive and the bidders are expected to take all costs involved while quoting the rates that will not be subject to variation on any account.

a) All setting out and survey work;

b) Temporary access roads and bridges, fencing, watching, lighting;

c) Paying fees and giving notices to Authorities;

d Payment of all patent rights and royalties;

e) Reinstatement of the Site;

f) Safety precautions and all measures to prevent erosion and suppress fire and other hazards;

g) Interference to the Works by persons, vehicles, and the like being legitimate users of the facilities on or in the vicinity of the Site;

h) The protection and safety of JMRC trains and services;

i) Supplying, maintaining and removing on completion the Contractors own accommodation, offices, depots, stores, workshops, transport, welfare services and other facilities including telephones and facsimile machines and all charges in connection therewith;

j) The supply, inspection, testing, packaging handling and transportation of materials and of the Works as specified including the provision and use of equipment and arrangements for the Engineer's Inspectors and others;

k) Maintaining public thoroughfares and footpaths and maintaining access upon existing recognised routes;

l) Providing, transporting to the Site, setting to work, operating (including all fuel and consumable stores), maintaining and removing from the Site upon completion all Construction Plant and Contractor's Equipment & machinery necessary for the execution of the Works and including the cost of all tests and other requirements in respect of such plant and equipment & machinery;

m) Working adjacent to or across existing services and installations;

n) Complying with the requirements of the Employer in regard to Safety and Health. Quality Assurance, Environmental, and project implementation plan;

o) Co-ordination and interference to the works by the works of Designated Contractors and others employed by JMRC being legitimate users of the facilities on or in the vicinity of the Site;

p) Remedying of defects and works of amendment, reconstruction, replacement of other faults, fair wear and tear excepted, during Defects Liability Periods

q) Protections to be implemented against Electro magnetic interference effects following line energisation;

r) Insurance, including all risks in supply, erection, storage, transit, third party, Workmen's Compensation and others;

s) All tools, equipment and other arrangement required for all tests prior and after delivery, and for testing and commissioning installed systems including for CRS inspection;

t) Carrying out all modifications to the given drawings, preparing detailed construction drawings and supplying originals, copies, and electronic files in accordance with Employer's Requirements.

1.3.3 Non-priced Items

Items against which no rate or sum is entered by the bidder, whether

quantities are stated or not shall be regarded as covered by other rates in the Bills of Quantities.

1.3.4 Tender Pricing

The bidder shall take regard of the actual site conditions and the estimated quantities entered in the various bills. The bidder shall price his tender accordingly and the unit prices entered against a bill line item shall be the full and only price paid for all works performed against that item except as described in the Tender Documents.

The bidder shall price the Bills of Quantities in Indian Rupees and/or in freely convertible international trading currencies only.

1.3.5 Measurement and Payment

1) This Contract is primarily a re-measure contract with items that are described herein. For the re measure items the total price to be paid for a work item will be as per quantities actually performed. The contract also contains some lump sum items for which special payment terms are described.

2) The measurement and payment described is for the purpose of making a valuation of the work acceptable to the Engineer, and Interim Payments to the Contractor, as work proceeds. The works as executed will be measured for assessment of progress for interim payments in accordance with the method adopted in the Specification, the Bills of Quantities and under the items as set forth notwithstanding any custom to the contrary.

3) Building works will be measured in accordance with the local practice as proposed by the Contractor and accepted and approved by the Engineer. For the measurement of “Numbers’ and “Sets” these shall be by count, using dimensions and contents as described in the specifications.

4) Notwithstanding anything stated herein the Engineer retains the right to withhold payment on any item due for payment when the service to be performed is not performed, or is not carried out to the Engineer’s satisfaction.

5) Prices for plans, programmes, documents, drawings, design calculations, test procedures, interface co-ordination documents, and the like for review by the Engineer shall be the full compensation for documents and the like in accordance with the specifications. Compensation shall include for the preparation, submission, and all subsequent revisions, changes required and re-submittals as necessary as required by the specifications until accepted by the Engineer. Payment will be made for the plans, programmes, etc. accepted and approved by the Engineer. Subsequent payments of the same items will be made on acceptance by the Engineer of evidence that the Contractor has actively maintained and complied with the approved

plans and procedures, etc., including provision of revisions and changes as required by the Engineer since the previous payment for the same item.

6) Prices for integrated Testing and Commissioning shall be full compensation for the integrated testing and commissioning of track work under the Contract in accordance with the drawings and specifications. Compensation shall include for preparation, submittal, and revisions as required by the Engineer of testing plans and procedures; co-ordination with other Designated Contractors; conduct of approved tests as directed by the Engineer on installations, revisions, re-testing, fault finding, adjustments and reworking as necessary; submittal of all test reports and other documents all to the approval of the Engineer. Payment will be made for each Section after certification by the Contractor and acceptance of the Engineer that the Track works have successfully completed the test procedures, and have been set-to-work and all test results and other documentation; have been approved by the Engineer.

7) Prices for As-Built drawings shall be full compensation for the provision of As-Built drawings in accordance with the specifications. Compensation shall include for the preparation, submission and all subsequent revisions, changes required and re-submittals as necessary as required by the specifications until accepted by the Engineer. Payment shall be made when all the As-Built drawings have been reviewed and accepted by the Engineer.

8) Prices for supply terms shall be for the full compensation for supplying the items in accordance with the drawings and specifications. Compensation shall include for all costs incurred in procurement/manufacture, testing, inspection, shipping, hauling, loading/unloading, handling/re-handling & transportation by all means & storing at site in Jaipur. Payment will be made for the items delivered and stored in a place and manner approved by the Engineer. Payment will be made on the basis of 90% for delivery to contractor's depot in Jaipur, and balance 10% for integrated testing and commissioning as certified by the Engineer as per clause 8 above. Payment on delivery will be made against the following documents:

   - Certificate of all tests and inspections in accordance with the Employer's Requirements;
   - Proof of insurance; and
   - Technical literature and manual.

   Prices for installation items of track work shall be for the full compensation for the installation of track work in accordance with the drawings and specifications. Compensation shall include for all costs incurred for transporting to location, handling of all materials up to point of installation, survey, temporary work, form work, preparing for installation/erection and mounting, aligning, fastenings and securing devices; adjusting as necessary, making good and clearing the location on completion, all to the approval of the Engineer. Shall include Testing and Commissioning of all Track work forming the Works in accordance with the specifications. Payment will be made after certification by the

Contractor and acceptance by the Engineer that the track works have successfully completed the test procedures, and have been set-to-work and that all test results and other documentation, as described in the specifications, have been approved by the Engineer.

However, the contractor shall be entitled for the part payment (percentage rate of the applicable BOQ items), as per attached part payment schedule (Appendix – C of BOQ Section 4 Volume II).

SECTION 2 EXPLANATORY NOTES OF BOQ

The item description is intended to briefly describe the work to be performed under that item and to identify associated work. It is not a full and complete description of the work to be performed and the Contractor shall carry out all the work necessary to meet the requirements of the Specification.

Note:

The Bills of Quantity have been split into the following parts:

2.1	G1	General Requirements
2.2	SPM 1	Supply of Permanent Way Material
2.3	BLT 1	Installation of Ballastless Track
2.4	M1	Miscellaneous Items

2.1 Bill No. G1 General Requirement

2.1.1	**Item 1**	**Plans submission & approval (as per appendix 4 of General Specifications)**
	Item 1.1	**Quality Assurance System Plan (QASP)** This item shall cover the QASP as specified in the Employer's Requirements. It shall essentially include, but not limited to: • Quality manual; • Work instructions; The price shall also include the QASP development, maintenance and implementation as well as cost of document originals, 5 copies, and electronic files.
	Item 1.2	**Health & Safety Management Plan (HSMP)** This item shall cover the HSMP as specified in the Employer's Requirements. It shall essentially include, but not limited to: • Health & Safety manual; • Site safety plan; • Risks assessments; • Method statements.

		The price shall also include the HSMP development, maintenance and implementation as well as cost of documents originals, 5 copies, and electronic files.
	Item 1.3	**Environmental Plan** This item shall cover the Environmental Plan as specified in the Employer's Requirements. It shall essentially include, but not limited to: • Environmental Management plan; • Environmental Mitigation plan; The price shall also include the plan development, maintenance and implementation as well as cost of documents originals, 5 copies, and electronic files.
	Item 1.4	**Project Implementation Plan** This item shall cover the Project Implementation plan as specified in the Employer's Requirements. It shall essentially include but not limited to: • Project Implementation Plan including works programme; • Interface Management Plan; • Procurement and Manufacturing Plan; • Installation Plan; The price shall also include the plan development, maintenance and implementation as well as cost of document originals, 5 copies, and electronic files.
	Item 1.5	**Testing Procedure Plan** This item shall cover the Testing Procedure Plan including integrated testing and commissioning as specified in the Employer's Requirements Chapter 3 and Chapter 8 of General Specifications. It shall essentially include but not limited to the details of tests to be carried out and the procedures and acceptable values to perform them. The price shall also include the plan development, maintenance and implementation as well as cost of documents originals, 5 copies, and electronic files.
2.1.2	**Item 2**	**As Built Drawings (as per appendix 4 of General Specifications)**
		As Built Drawings The Price under this item shall include the cost of supplying

		As-Built drawings, as specified in the Chapter 9 of Particular Specification of Employer's Requirements. The As-built drawings shall be submitted as per Chapter 4 of General Specification in original, 5 copies (laminated) and electronic files.

2.2 Bill No. SPM 1 Supply of Permanent Way Materials

2.2.1	**Item 1**	**Supply of Head Hardened Rails (UIC 60, IRS-T-12-2009, 1080 Grade HH)** The price shall include the cost of supplying of HH Rails as per Employer's Requirements, mainly consisting but not limited to: • UIC 60/60E-1 Head Hardened Rails, Grade 1080 (Class "A") • Indian Railway Specifications for flat bottom Railway Rails No. T-12-2009 with all correction Slips/Corrigendum up to the date of submission of Tenders. • Cost of developing, manufacturing & supplying of HH Rails including cost of deployment of all plant, machinery required. • Cost of all material & labour • Cost of inspection & acceptance test. • Shipping, Handling, transportation loading, unloading, stacking/storing up to project site in Jaipur. • The supplier shall obtain insurances completed up to purchaser's storage areas in Jaipur. • Further spare HH Rails are to be handed over to Store of JMRC, O&M / Jaipur. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involve while handing over of spare Rails to JMRC, O&M / Jaipur. • The following inspections and tests shall be performed a) The testing and inspection of HH rails (UIC 60 IRS-T-12-2009), 1080 Grade shall be strictly in accordance with the Testing and Inspection plan approved by Purchaser.

		b) The purchaser shall appoint Inspecting authority for pre-dispatch/pre-shipment inspection & testing of materials as per approved inspection and testing plan at purchaser's cost. Where no procedure for testing is specified, the supplier shall propose suitable standard or particular procedures for Purchaser's Approval. c) In addition to the inspection and testing by inspecting authority, the purchaser or his authorized representative may also witness the tests and/or conduct test checks to be organized by supplier for validation of test/inspection by inspecting authority. The expense of such tests shall be borne by the supplier. d) Periodically, during the Contract the purchaser/his authorized representative may conduct inspections of manufacturing activities at the premises of the supplier and those of his sub suppliers. Such inspections shall include quality procedure checks, witness inspections, both routine and prototype, and shall also be for the purpose of monitoring progress. During each inspection suitably qualified staff shall be provided by the supplier.
2.2.2	**Item 2**	**Clearance and transportation of imported UIC 60 head hardened rails IRS-T-12-2009 18 m long from CIF, Port in India to storage area site in Jaipur including Custom duty, Port handling charges etc.** • The supplier shall be responsible for all loading, unloading, including custom clearance, port handling and transportation up to purchaser's area in Jaipur including stacking. • The supplier shall obtain insurances completed up to purchaser's storage areas in Jaipur.
2.2.3	**Item 3**	**Manufacturing and Supply of Standard Gauge Turnouts and Scissor - X - Over with UIC 60 rails as per technical specifications and as per drawings approved by purchaser.**
	Item 3.1	**1 in 9 turnout (ballastless)** The price shall include the cost of supplying of Turnouts as per Employer's Requirements, mainly consisting but not limited to: • Cost of developing, manufacturing & supplying of Turnouts including cost of deployment of all plant, machinery required

		• Cost of all material & labour • Cost of inspection & acceptance test. • The supplier shall be responsible for all loading, unloading, including custom clearance, port handling and transportation up to purchaser's area in Jaipur including stacking. • The supplier shall obtain insurances completed up to purchaser's storage areas in Jaipur. • Further spare materials are to be handed over to Store of JMRC, O&M / Jaipur. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involve while handing over of spare materials to JMRC, O&M / Jaipur. • The inspections and tests shall be carried out as per inspection & Test Plan proposed by supplier and approved by purchaser. • The Inspections and tests shall be conducted at manufacturing facility / premises of the supplier by the inspection agency nominated by purchaser.
2.2.4	**Item 4**	**Glued Joints**
	Item 4.1	**Shop Fabricated Glued Insulated Joint G3 (L) type as per RDSO drawing for UIC 60, 1080 grade HH rails.** The price for item nos. 4.1 shall include the cost of supplying of glued Insulated Rail Joint as per Employer's Requirements and drawings, mainly consisting but not limited to: • Cost of manufacturing & supplying of Glued Insulated Joint including cost of deployment of all plant and machinery. • Cost of all material & labour • Inspection and acceptance tests • Detailed documentation & procurement as per Employer's Requirements • Handling/re-handling, transportation, loading, unloading, stacking/storing up to project site in Jaipur. • Cost of cutting, drilling, transportation & handling of Rail etc. complete. For the supply of Glued Insulated Joints under Item No. 4.1 the cost of associated rail length shall not be included in the price of this item as the same shall be supplied by the employer free of cost at contractor's depot/project site in Jaipur.

		Further spare materials under item 4.1 are to be handed over to Store of O&S Directorate, JMRC, Jaipur. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involve while handing over of spare materials to O&S Directorate, JMRC.
2.2.5	**Item 5**	**Joggled fishplate with Clamps for UIC 60 Rails** • Joggled fish Plate as per Railway's Latest Drawing. • Clamp (as per tentative drawing attached in Section-6. Final drawing shall be issued to successful bidder). • Joggled fish Plate with Clamps per joint means two Clamps and two Joggled fish Plate.
2.2.6	**Item 6**	**Buffer stop (Friction Type) for Standard Gauge**
	Item 6.1	**Buffer Stop (Friction Type) for Main Line & Test Track (25 kmph)** The price shall include the cost of supplying of buffer stop as per Employer's Requirements, mainly consisting but not limited to: • Cost of developing, manufacturing & supplying of Buffer Stop including cost of deployment of all plant, machinery required • Cost of all material & labour including all fittings fastening & fixtures etc. complete for installation on track. • Cost of inspection & acceptance test. • Detailed documentation including drawings, Technical details & calculations & procurement as per Employer's Requirements • Shipping, Handling, transportation loading, unloading, stacking/storing up to project site in Jaipur. • Further spare Buffer Stops are to be handed over to Store of O&S Directorate, JMRC. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involve while handing over of spare buffer stop to O&S Directorate, JMRC.
2.2.7	**Item 7**	**Ballastless Track Fastening System 336**
	Item 7.1	**For Straight Track 2 Hole Fastening**
	& Item 7.2	**For Curved Track 4 Hole Fastening**

		The price shall include the cost of supplying of ballastless track fittings as per Employer's Requirements and Performance Criteria laid down by RDSO, mainly consisting but not limited to: • Cost of developing, manufacturing & supplying of ballastless track fittings including cost of deployment of all plant, machinery required • Cost of all material & labour including all fittings fastening & fixtures etc. complete for installation on track. • Cost of inspection & acceptance test. The contractor will appoint a third party experienced and reputed inspection Agency with the approval of employer and carry out all tests at his own cost. • Detailed documentation including drawings, Technical details & calculations & procurement as per Employer's Requirements. • Shipping, Handling, transportation, loading, unloading, stacking/storing up to Project Site in Jaipur.
2.2.8	**Item 8**	**Hand operated Mechanism for 1 in 7 Ballasted Derailing Switch** The supplier shall be responsible for detailed design of hand operated mechanism, required for hand operated switches in depot lines, including its connections with the switches with prior approval of purchaser.

2.3 Bill No. BLT-1: Installation of Ballastless Track (Phase 1B, East-West Corridor)

2.3.1	**Item 1**	Laying Plinth and Installation of Track Work for plain track with UIC 60 Head Hardened Rail with all fittings and Fastenings etc. complete in all respect in Underground. The Price of item No 1(a) shall include complete laying of track on reinforced concrete plinth as per Employer's Requirements and drawings mainly consisting but not limited to the following: • Design of Track Structure to suit proposed Ballastless Track Fittings and JMRC requirements. Typical Drawing of Ballastless Track Structure and reinforcement has been given in Section-6 for Underground (Circular/Box/NATM) section.

		• Minimum Height of Track Structure including height of fitting, Rail and plinth/slab must be in 404 mm. Further refer clause C1.a of Annexure 4 of ITT which limits major deviation. • Cost of survey and setting out including cost of deployment of all survey equipment, pegging markers, reference markers etc. • Loading, handling/re-handling, transportation and unloading of all materials (including the materials supplied by the employer) from stock area to site including cost of deployment of plant, equipment & machinery. • Cost of all temporary works including service/temporary track & permanent works etc. to carry out the work. • Setting up of formwork, false work including deployment of all equipment, plant & machinery and cost of track supporting work including jigs and fixtures. Fixing of reinforcement for plinth. • Assembling and laying of track with all fittings & fastenings including Glued Insulated Joints, etc. complete. • Cost of RCC, supply & welding of M.S. Plate to the plinth reinforcement, supply & connecting copper cables with M.S. Plates for electrical continuity. • De-stressing of the CWR and final fastening down of track including cost of deployment of necessary equipment. • Cost of all temporary/permanent markers including paint markers on rail. • Cost of cutting, drilling, jointing, except rail welded joints • Cost of all Rail Welding shall not be included in this item and shall be paid separately under the item of Rail Welding. • Provision of Track Drainage as per Employer's Requirements and drawings. • Inspection, measurement and acceptance tests. • Detailed documentation and records. • Cost of handling /re-handling, transportation /placement of rail panels of all lengths. The above cost shall consider the following: **1(a)** Shear Connector already provided **1(b)** Rates over and above 1 (a) & if, Shear Connector to be provided by contractor

<table>
<tr><td></td><td></td><td>1(c)</td><td>Provision of an approved Mass Spring System (MSS) in Tunnels.

Rates over and above 1 (a)

The price of item includes mainly consisting but not limited to the following:

i) Providing an approved Mass Spring System (Full surface layer) between 1st and 2nd stage of concrete in Circular tunnels.
ii) Each section of MSS will be equipped with the transition zone of adequate length on both sides of such stretch of MSS consisting of half thickness approved MSS.
iii) Design of track slab with MSS.
iv) Cost of additional RCC and other resources over and above 1 (a) for installation of track with MSS as a complete.
v) Approximate quantity of MPE Sheets. (For guidance purpose only)

<table><tr><td>Type of Tunnel</td><td>Qty. required for main zone per track meter with 25 mm thick MPE sheets including top cover of shear key</td><td>Qty. required per track meter for transition zone – 15 meter on each side with 12.5 mm thick MPE sheets including top cover of shear key</td></tr><tr><td>Circular tunnel</td><td>3.60 Meter</td><td>3.60 Meter</td></tr></table>
The contractor will be responsible for proper grading of the base for achieving uniform Rail level in main as well as transition zone
vi) Cost of MSS materials and all type of labour

The cost of item includes procurement of MSS materials including shipping, handling, transportation to site inclusive of all duties & taxes and placing / fixing to the correct location below track plinth / slabs.
vii) Inspection & acceptance test.
viii) The MSS experts for supervision of work / installation of MSS should be arranged.</td></tr>
<tr><td>2.3.2</td><td>Item 2</td><td colspan="2">Laying plinth / RCC Slab and installation of Turnout with UIC 60 Head Hardened Rail with all fittings and Fastenings etc. complete in all respect.</td></tr>
<tr><td></td><td>Item 2.1</td><td colspan="2">1 in 9 Turnouts</td></tr>
</table>

		The Price shall include complete laying of Turnout & Scissor on reinforced concrete plinth or slab as per Employer's Requirements and drawings mainly consisting but not limited to the following: • Cost of survey and setting out including cost of deployment of all survey equipment, pegging markers, reference markers etc. • Loading, handling/re-handling, transportation, and unloading of all materials (including the materials supplied by the employer) from stock area to site including cost of deployment of plant, equipment & machinery. • Cost of all temporary works including service /temporary track & permanent works etc. to carry out the work • Setting up of formwork, false work including deployment of all equipment, plant & machinery and cost of track supporting work including jigs and fixtures. • Fixing of reinforcement for plinth. • Assembling and laying of turnout with all fittings & fastenings including glued insulated joints etc. complete. Cost of plinth, supply & welding of M.S. Plates to the slab reinforcement, supply & connecting copper cables with M. S. Plates for electrical continuity. • Incorporation of turnout in CWR including cost of deployment of necessary equipment. • Cost of all temporary/permanent markers including paint markers on rail. • Cost of cutting, drilling, jointing, except Rail Welded joints • Cost of all Rail Welding shall not be included in this item and shall be paid separately under the item of rail welding. • Provision of Track Drainage as per Employer's requirements and drawings. • Inspection, measurement and acceptance tests. • Detailed documentation and records. • Cost of supply and fixation of Shear Connectors. • Cost of mounting arrangement of S& T fixtures and point operating mechanism including second drive (in case of 1 in 9 turn out). • In case of Turnout – scope of work from SRJ to BOC.

2.3.3	**Item 3**	**Installation / Dismantling of Buffer Stop (Friction type) for Standard Gauge**
	Item 3.1	**25 kmph Speed Potential** The price shall include the cost of installation / dismantling of buffer stop as per Employer's Requirements mainly consisting but not limited to the following: • Loading, handling / re-handling, transportation, and unloading of all materials from stock area to site including cost of deployment of plant, equipment & machinery. • Installation of the Buffer Stop with all fittings and Fastenings etc. complete including torque testing.
2.3.4	**Item 4**	**Rail Welding**
	Item 4.1	**Flash butt welds** The prices shall include carrying out of Flash Butt Welding of UIC 60 1080 Grade, Head Hardened Rails as per Employer's Requirements consisting but not limited to the following**:** • Cost of arrangements including temporary arrangements, deployment/ redeployment of mobile flash butt welding plant at the site of work. • Cost of operation, fuel, staffing, maintenance etc. complete for the plant • Cost of cutting, straightening (pre weld and post weld) • Cost of post weld treatment • Cost of carrying out all inspection and acceptance tests, test welds including 3rd Party (approved by RDSO) USFD Testing for all welds. This shall include deployment of all necessary equipment, plant, machinery & staffing. • Cost of all labour, lead, lift, lifting tools, equipment and other related expenses. • Cost of re-testing and re-placement of defective weld and associated rail length. • Cost of handling/rehandling, transportation, placement of rails for the purpose of welding. • The payment under this item shall be made to the contractor only for number of finished and accepted welds in the track.
	Item 4.2	**Carrying out of Alumino-Thermic Welding** The price shall include carrying out of Alumino-Thermic Welding of UIC 60, 1080 grade, Head Hardened Rails as

		per Employer's Requirements, consisting but not limited to the following: • Cost of welding material and equipment as per specifications including handling, transportation, loading, unloading, stacking/storing up to project site/work site. • Cost of carrying out all inspection and acceptance tests, test welds including 3rd Party (approved by RDSO) USFD Testing for all welds. This shall include deployment of all necessary equipment, plant and machinery & staffing. • Cost of post weld treatment • Cost of cutting of rails, cost of all labour, lead, lift, tools, equipment and other related expenses. • Cost of re-testing and re-placement of defective weld and associated rail length. • The payment under this item shall be made to the contractor only for number of finished and accepted welds in the track.
2.3.5	**Item 5**	**Carrying out of Rail Paintings at Stations and whole Underground portion.** • The Price shall include Painting of Rail at with Anti Corrosive Paint as per Employer's requirement. Consisting but not limited to the following: • Painting of Rails – • Gauge face side - foot and web and excluding gauge face surface. • Non-gauge face side – foot, web and non gauge face of the rail. • Surface preparation shall not be done unless the approved paints in sufficient quantities are available in stock at site. Sufficient care should be taken in preparing the surface and is, therefore, required to be done under proper supervision. The surface shall be made free from oil, grease and dust. The surface shall be rubbed with wire brush and sand paper etc. The tools used may be hand or power operated such as scrappers, wire brushes, sand paper; pumice stones, etc. The surface prepared may be checked by visual observation for uniformity of surface. • Anti Corrosive Paint and methodology for Rail Paintings shall approved by employer. However Paint already approved by JMRC/RDSO shall be given preferences.

<table>
<tr><td></td><td></td><td>

Rail Surface shall be allowed to dry for sufficient time after application of one coat and before start of second coat say minimum 8 hours.
Surface preparation/ painting shall not be done in the following conditions.
When the ambient temperature is below 10° centigrade or above 50° centigrade.

In rainy season.
During night.
In winter before 8.00 A.M.
In summer between 11.00 A.M. and 3.00 P.M. on areas that are likely to be exposed to direct sun light.
Extremely windy/misty/dust blowing conditions.

Chemicals should not be used for surface preparation.

</td></tr>
<tr><td>2.3.6</td><td>Item 6</td><td>Payment for Additional / Extra RMC including other associated expenditure due to increase in plinth / slab heights only over and above given in tender drawings (no additional payment for increase in width of plinth / slab due to change in design of slab / plinth w.r.t. tender drawings). This item includes additional requirement of steel, RMC, shuttering, manpower and other related expenses due to increase in height of plinth / slabs over and above than tender drawing. Quantity of additional / extra RMC shall be calculated from site survey of plinth/slab. Increase of plinth / slab height due to super elevation shall not be considered for calculation of extra RMC. Upper limit of Variation of plinth / slab height without extra payment have been given in Section 6 of Tender Document considering minimum plinth 185mm. If bidder proposes different track structure with enhanced minimum plinth / slab height, upper limit of plinth / slab given in tender drawing shall also be enhanced accordingly and quantity for extra RMC for payment shall be calculated over and above of enhanced upper limit of plinth / slab height. This clause is applicable only as per site conditions.

If minimum Plinth Depth varied in following range no extra payment will be made

<table>
<tr><td>Location</td><td>Range of Plinth Depth</td></tr>
<tr><td>Viaduct</td><td>185 - 250</td></tr>
<tr><td>Circular Tunnel & Box Tunnel</td><td>185 - 250</td></tr>
<tr><td>Station on Viaduct</td><td>185 - 340</td></tr>
</table>
</td></tr>
</table>

2.3.7	**Item 7**	**Installation of Hand Operating Mechanism for 1 in 7 Ballasted Derailing Switch including its connection with switches etc complete at Mansarover Depot as per employer's requirement.**
2.3.8	**Item 8**	**Installation of Brackets & Check Rail on underground including core cutting of holes, grouting including transportation of materials on underground and drilling holes in check rails complete.** The Price shall include complete installation of Brackets & Check Rail on underground sharp curve as per Employer's Requirements mainly consisting but not limited to the following: • Cost of survey and setting out including cost of deployment of all survey equipment, pegging markers, reference markers etc. • Loading, handling/re-handling, transportation, and unloading of all materials (including the materials i.e. Check rails, GI Brackets, GI Plates, H.S. bolts, M.S. Bolts, nuts & washers and other materials supplied by the employer) from stock area to site including cost of deployment of plant, equipment & machinery. • Cost of all temporary works including service/temporary track & permanent works etc. to carry out the work • Inspection, measurement and acceptance tests. • Further spare materials are to be handed over to Store of O&S Directorate, JMRC. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involve while handing over of spare materials of check rails to O&S Directorate, JMRC.

2.4 Miscellaneous Items (M1)

2.4.1	**Item 1**	**Miscellaneous items based on DSR 2014 (of CPWD) schedule items. The rate for this item shall be quoted as % above or below the DSR 2014 (of CPWD) Schedule Rates.**

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Section 4 –Bidding Forms (BDF)

(Schedules of Price)

Part II – Bill of Quantities

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PREFACE

The Bill of Quantities consists of five Bills. The Grand Summary collects all prices in the fifth bill and carries the total for all Bills forward to the Tender Price.

The prices shall be divided into an imported part expressed in Foreign Currency, and local part expressed in Indian Rupees.

The bidder shall complete and submit all bill sheets endorsed by the signature of his authorized representative.

TENDER PRICE

(THIS DOCUMENT IS TO BE PREPARED AND COMPLETED BY THE BIDDER)

In accordance with the accompanying and signed Form of bid, we (the Bidder) offer to supply, install, test, commission including Integrated Testing & Commissioning and remedying any defects of the whole said works for Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India in conformity with the said drawings, particular specifications, conditions of contract, employer's requirements, bill of quantities and other documents of bid, for the sum of:

(In words) ……INR
(In figures) ……...INR and
(In words) ……Foreign Currency
(In figures)……...Foreign Currency or such other sum as may be ascertained in accordance with the said Conditions and Specifications.

Signature: ……..…….……...
Name:……...
For and on behalf of: ……..
Address: …….
Date: ……

Witness:

Signature: ……...
Name:……
Address ……...

Witness:

Signature: ……...
Name:……
Address ……...

GRAND SUMMARY

(Collection of Bills)

		Total Brought Forward from Bills of Quantity	
Bill No.	**Sections**	**Foreign Currency Amount**	**Indian Rupees Amount**
G1	General Requirements		
SPM1	Supply of Permanent Way Material		
BLT1	Installation of Ballastless Track		
M1	Miscellaneous Items		
Grand Summary (Total for all Bills) Carried to Tender Price			
Amount of Service Tax considered in above quoted price			

2.1 Bill No. G1: GENERAL REQUIREMENTS

Item no.	Description of Items	Unit	Total Qty.	Rate in INR	Rate in Foreign Currency	Amount in INR	Amount in Foreign Currency
1	**Plan submission & approval**						
1.1	Quality System Assurance Plan	Set	1				
1.2	Health and Safety Management Plan	Set	1				
1.3	Environmental Management Plan	Set	1				
1.4	Project Implementation Plan	Set	1				
1.5	Testing Procedure Plan	Set	1				
2	**As Built Drawings**	Set	1				
	Total (carried forward to Grand Summary)						

2.2 Bill No. SPM 1: Supply of Permanent Way Material

Item no.	Description of Items	Unit	Total Qty.	Rate in INR	Rate in Foreign Currency	Amount in INR	Amount in Foreign Currency
1	Supply of Head Hardened Rails (UIC 60, IRS-T-12-2009, 1080 Grade HH)	MT	578				
2	Clearance and transportation of imported UIC 60 head hardened rails IRS-T-12-2009 18 m long from CIF, Port in India to storage area site in Jaipur including Custom duty & Port handling charges etc.	MT	578				
3	Manufacturing and Supply of Standard Gauge Turnouts and Scissor - X - Over with UIC 60 rails as per technical specifications and as per drawings approved by purchaser						
3.1	1 in 9 turnout (ballastless)	Set	2				
4	Insulated Glued joints						
4.1	Insulated Glued Joints G3 (L) type as per RDSO drg no. T-5843	Nos.	8				
5	Joggled fishplate with Clamps for UIC 60 Rail	Per Joint	20				

Item no.	Description of Items	Unit	Total Qty.	Rate in INR	Rate in Foreign Currency	Amount in INR	Amount in Foreign Currency
6	Buffer stop (friction type)						
6.1	Buffer stop (friction type) for main line and test track in depot for 25 kmph for Standard Gauge	Nos.	3				
7	Supply of Track Fastening System 336 for Ballastless Track						
7.1	For Straight Track (Two Hole)	Set	12850				
7.2	For Curved Track (Four Hole)	Set	2900				
8	Hand operated Mechanism for 1 in 7 Ballasted Derailing Switch	Set	1				
	Total Carried Forward to Grand Summary						

2.3 Bill No. BLT1: INSTALLATION OF BALLASTLESS TRACK

Item no.	Description of Items	Unit	Total Qty.	Rate in INR	Rate in Foreign Currency	Amount in INR	Amount in Foreign Currency
1	Laying plinth & installation of track work for plain track with UIC 60 head hardened rails with all fittings and fastenings etc. complete in underground						
(a)	Where Shear connector is already provided	Track m	5000				
(b)	Rate over and above (a) if shear connector to be provided by contractor	Track m	500				
(c)	Rate over and above (a) Provision of an approved Mass Spring System between 1st and 2nd stage concrete in Circular tunnels for a width of 3600 mm.	Track m	3900				
2	Laying RCC slab & installation of turnout with UIC 60 head hardened rails with all fittings and fastenings etc.						
2.1	1 in 9 turnout	Set	4				
3	Installation / Dismantling of Friction Type Buffer Stops						
3.1	25 Kmph Speed Potential	Nos.	6				
4	Welding of UIC 60, 1080 Grade HH Rails						
4.1	Flash Butt Welds	Nos.	560				
4.2	Alumino Thermic Weld	Nos.	115				

Item no.	Description of Items	Unit	Total Qty.	Rate in INR	Rate in Foreign Currency	Amount in INR	Amount in Foreign Currency
5	Painting of rail at Stations at viaduct, complete underground portion, main line turnouts and covered lines in Depots with Anti Corrosive Bitumen Black Paint as per IS:9862	Track m	5000				
6	Payments for all expenditure over and above for plinths height specified in tender drawing.	Cum	50				
7	Installation of hand operating mechanism for 1 in 7 type Derailing Switch.	Nos.	1				
8	Installation of Brackets & Check Rail on underground including core cutting of holes, grouting including transportation of materials on underground and drilling holes in check rails complete.	Track m	100				
	Total Carried Forward to Grand Summary						

2.4 Bill No. M1: MISCELLANEOUS ITEMS

Item no	Description of Items	Unit	Percentage	Amount in INR	Amount in Foreign Currency
1	Miscellaneous items based on DSR, 2014 (of CPWD) schedule items (for Lump Sum Value of Rs. 25 Lakhs)	% above or below DSR 2014 schedule			Not Applicable
	Total Carried Forward to Grand Summary				

APPENDIX A

Monthly Cash Flow for the Contract

This Document is to be prepared by the bidder and submitted as part of Appendix 2 to the Form of Tender.

APPENDIX B

Deviations, Conditions, Qualifications etc.

To .....

Dear Sir,

Our prices given in the Bills of Quantity are subject to the following deviations, reservations, conditions, qualifications etc. These deviations, reservations, conditions, qualifications etc. are exhaustive. Except for these deviations, reservations, conditions, qualifications, etc., the entire work shall be performed as per the Tender Documents. We are also furnishing below the cost of unconditional withdrawal for the deviations, reservations, conditions, qualifications, etc. proposed by us. We confirm that we shall withdraw the deviations, reservations, conditions, qualifications etc. at the cost of withdrawal indicated in this statement failing which our Tender may be cancelled and the Tender Guarantee forfeited.

SN	Deviations/reservations/Conditions/ Qualifications etc.	Cost of Unconditional Withdrawal	
		Foreign Currency Portion	Local Currency Portion (in INR)

Date .....……..

Place .....……..

(Signature) .....

(Name) .....

(Designation).....

(Common Seal) .....

APPENDIX C

Part Payment Schedule

Bill No.SPM-1 – All Items

SN	Description of items	Percentage for Part Payment	Cumulative Percentage
1.	Supply of P. Way materials at work site in Jaipur in undamaged condition and submission of Inspection Report and indemnity Bond.	90%	90%
2a.	Testing and Commissioning of Corridors / Depots where materials have been installed / used.	10%	100%
2b.	Returning of balance P. Way materials if any to JMRC stores as directed by Engineer including handling / re-handling, transportation, stacking with proper accountal.		

Bill No.BLT-1

Item No.	SN	Description	% for Part Payment	Cumulative %
1 a & b	Laying plinth & installation of track work for plain track with UIC 60 head hardened rails with all fittings and fastenings etc. complete in underground			
	1	Surveying etc.	5%	5%
	2	Provision of shear connectors, Rail setting, Plinth construction etc.	65%	70%
	3	Rear work to achieve final tolerances, de-stressing, cleaning as per employer's requirement, etc.	20%	90%
	4	Interface requirement of OHE and signaling contractor, measurement of final tolerances, acceptance tests, markers, testing and commissioning, employers other requirement etc.	10%	100%
1 c	Rate over and above (a) Provision of an approved Mass Spring System between 1st and 2nd stage concrete in Circular tunnels for a width of 3600 mm.			
	1	Supply of MSS at site in Jaipur in undamaged conditions along other documents	70%	70%
	2	Installation of MSS with track slab	20%	90%
	3	Further Testing and commissioning of the section	10%	100%
2	Laying RCC slab & installation of turnout with UIC 60 head hardened rails with all fittings and fastenings etc.			
	1	Surveying, etc.	5%	5%
	2	Assembling, laying of T/O provision of Shear connectors, slab construction etc.	65%	70%
	3	Rear work to achieve final tolerances, de-stressing, cleaning as per employers requirement etc.	20%	90%
	4	Interface, requirement of OHE and signal contractor Measurement of final tolerance, acceptance tests, marker, testing and commissioning employer other requirement etc.	10%	100%
3.1	Installation / Dismantling of Friction Type Buffer Stops - 25 Kmph Speed Potential			
	1	Surveying Loading, transporting, fixing at final location including commissioning, testing and submission of test certificate.	90%	90%
	2	Submission of all records, Check lists for compliance of all items and employers other requirement.	10%	100%
4.1	Welding of UIC 60, 1080 Grade HH Rails – Flash Butt Welds			
	1	Flash butt welding by mobile flash butt welding plant as per specifications.	60%	60%
	2	Submission of results of test weld.	10%	70%
	3	Profile grinding and submission of tolerance	15%	85%
	4	Submission of results of fatigue test, residual stress test, marking etc.	5%	90%
	5	Submission of weld record, USFD, Tolerances and employers other requirement etc.	10%	100%

Item No.	SN	Description	% for Part Payment	Cumulative %
4.2	Welding of UIC 60, 1080 Grade HH Rails – Alumino Thermit Weld			
	1	Alumino Thermit welding as per specifications	60%	60%
	2	Submission of results of test weld.	10%	70%
	3	Profile grinding and submission of tolerance	20%	90%
	4	Submission of weld record, USFD, Tolerances and employers other requirement etc.	10%	100%

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-II REQUIREMENTS

Section 6 – Employer's Requirements (ERQ)

Vol. I – General Specifications

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

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(As per Volume II of Section 6)

2. Drawings

(As per Volume II of Section 6)

3. Supplementary Information Regarding Works to Be Procured

(As per Volume II of Section 6)

4. Personnel Requirements

Using Form PER-1 and PER-2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has personnel who meet the following requirements:

No.	Position	Total Work Experience [years]	Experience In Similar Work [years]
1			
2			
3			
4			
5			

5. Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

No.	Equipment Type and Characteristics	Minimum Number Required
1		
2		
3		
4		
5		

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8.1 WORKS AREAS 1

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CHAPTER 1

1. GENERAL

1.1 Application of the General Specification (GS)

1.1.1.1 The provisions contained in the Particular Specification (PS) and the Employer's Drawings shall prevail over the provisions contained in this GS.

1.1.2 The provisions contained in the GS shall prevail over the provisions contained in International Standards, European Standards, British Standards, Indian Standards, British Standard Codes of Practice and similar standard documents stated in the Contract.

1.1.3 This GS shall be read in conjunction with the other documents constituting the Contract.

1.2 Abbreviations

Common abbreviations used in the GS and in the PS shall have the following meanings:

BCC	: Backup Control Centre
BS	: British Standard
CADD	: Computer Aided Design and Drafting
CAR	: Corrective Action Request
CNP	: Construction Noise Permits
COTS	: Commercial Off the Shelf
CPM	: Critical Path Method
CV	: Curriculum Vitae
DLP	: Defects Liability Period
JMRC	: Jaipur Metro Rail Corporation
E&M	: Electrical & Mechanical
EMC	: Electromagnetic Compatibility
EMIP	: Environmental Mitigation Implementation Plan
EMP	: Environmental Management Plan
EMSD	: Electrical and Mechanical Services Department
EMU	: Electric Multiple Unit
EN	: Euro-Norm (European Standards)
EPD	: Environmental Protection Department
ETI	: Employer's Training Instructors

FAT	: Factory Acceptance Test(s)
GCC	: General Conditions of Contract
GS	: General Specification (this document)
HV	: High Voltage
IEC	: International Electro-technical Commission
IP	: Ingress Protection
IS	: Indian Standards
ISO	: International Standards Organisation
ITT	: Instructions To Tenderers
LV	: Low Voltage
MC	: Metro Corridor
MMI	: Man-Machine Interface
MTR	: Mass Transit Railway
NSR	: Noise Sensitive Receivers
OCC	: Operations Control Centre
OCS	: Overhead Contact System (Rigid Conductor)
OSR	: Operational Safety Report
OSR(S)	: Operational Safety Report (Software)
OHE	: OverHead Equipment (Flexible Catenary)
P3	: Primavera Project Planner
PLC	: Programable Logic Controller
PPE	: Personal Protective Equipment
PS	: Particular Specification
PVC	: Polyvinyl Chloride
QA	: Quality Assurance
RC	: Rail Corridor
SAR	: Special Administrative Region
SAT	: Systems Acceptance Test(s)
SCC	: Special Conditions of Contract
SIL	: Safety Integrity Level
SQAP	: Software Quality Assurance Plan
SRR	: Submission Review Request
T/C	: Time Chainage
TRIP	: Track Related Installation Programme

1.2.1 Further abbreviations may be defined within the body of the GS or PS where there is only local applicability. Where such abbreviations exist the Contractor shall exercise great care that the abbreviation is not used out of context when communicating with the Employer, the Engineer or any Third Party.

1.2.2 Abbreviations of units of measurement used in the GS shall have the meanings as defined under the SI system of units.

1.3 Definitions

Words and phrases defined in the GCC or PCC shall retain the same meaning within the GS and PS unless specifically redefined within this GS or under the provisions of clause 1.1.1.1 above for the purpose of a particular clause or group of clauses.

(1) "**Access Dates**" are dates that are to be achieved by other than the Contractor and which are considered to be essential to the successful completion of the Contract to the original planned schedule. A list of the activities completion of which are considered to give rise to an Access Date are included in the PS.

(2) "**Commissioning**" means the process of setting to work the complete transportation system through a series of integrated tests that demonstrate the installation and performance in accordance with the specified criteria.

(3) **"Defined Area"** means an area within which Works Trains will be operated and the Employer's defined area working safety rules will apply.

(4) "**Installation Tests"** means the tests to be performed to verify the conformity of completion of an installation/assembly to the design documents previously reviewed without objection by the Engineer prior to the start of Commissioning. Installation Tests do not form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer's Taking Over of the Works or any Section however they must be successfully completed before the Tests on Completion can commence.

(5) **"Service Trial"** means the phase after completion of the System Acceptance Tests where the training and operating procedures are validated through the running of the trains to the published timetable. Service Trial form part of the Tests on Completion to be performed under the Contract in order to achieve Employer's Taking Over of the Works or any Section.

(6) "**Quality Control Point**" means a point in time when a notice or other document is to be submitted to the Engineer in accordance with the Contract before the Contractor can commence, proceed with or terminate an activity

(7) "**Quality Hold Point"** means a point in time when a notice of no objection by the Engineer is required.

(8) **"Specification** (the)" means the aggregate sum of the documents and any amendments thereto, issued to Tenderers by Employer as part of the Tender process before the final date for submission of Tenders. This shall include but not be limited to; Design Criteria, Employer's Requirements, Employer's

Tender Drawings, Preliminary Operating Plan and Clarification of Tender Documents issued in accordance with the ITT but shall not include the ITT itself nor any minutes of meetings.

(9) "**Specification (this)**" means the particular document within which the reference is made.

(10) "**Integrated Testing and Commissioning"** means those tests that demonstrate the integration of the complete transport system meeting the requirements of the Specification in an operating environment. Integrated Testing and Commissioning form part of the Tests on Completion to be performed by the Contractor in order to achieve Employer's Taking Over of the Works or any Section.

(11) "**Validation"** means the process of confirmation by examination and provision of objective evidence that the application produced achieves the particular requirements specified.

(12) "**Verification"** means the process of confirmation by examination and provision of objective evidence that the specified requirements have been incorporated within design.

1.4 Glossary of Terms

1.4.1 Words and expressions to which meanings are assigned in any paragraph of the GS shall have the same meanings in other paragraphs of the GS except when the context otherwise requires.

1.4.2 Utilities are electricity, lighting, traffic control, telephone and other communication cables, gas, water, sewage and drainage pipes and ducts, including all associated protection, supports, ancillary structures, fittings and equipment.

1.5 Submission for Review

1.5.1 Reference in the GS and PS to any submission made by the Contractor to the Engineer having been reviewed without objection by the Engineer shall mean the issue of a notice of no objection by the Engineer issued in response to a submission made by the Contractor. Documents, drawings, specifications, calculations, technical papers, material samples, methods of construction and any other matters which have been reviewed without objection by the Engineer shall not be changed without further submission for review to the Engineer of the proposed changes.

1.5.2 Clause 4.2 below prescribes the process to be adopted for submissions of documents, material samples and any other items to the Engineer. Schedules of items that are to be submitted to the Engineer for review are contained within this GS and/or the PS.

1.5.3 Submissions for review shall be made in accordance with the dates (relative to the Works Programme) stated in the GS and/or the PS, or in accordance with Appendix 4 of this Specification. For items not specifically given a submission date in the Specification submissions shall be strictly in accordance with the agreed Submissions Programme or as directed by the Engineer.

1.6 Standards, Codes of Practice

1.6.1 Unless otherwise stated in the Contract, reference in the GS to International Standards, European Standards, British Standards, British Standard Codes of Practice and similar standards shall be to that edition of the document stated in the PS, including all latest amendments issued by the relevant authority. In the event that no specific edition reference is given, the current edition as at the date of opening of tender shall apply.

1.6.2 Later editions of International Standards, European Standards, other national or international Standards or Codes of Practice and other similar standards, or standards which are considered to be equivalent, shall not apply unless reviewed without objection by the Engineer. The Engineer shall give or withhold his notice of no objection after the Contractor has provided him with a copy of the relevant standard for information. If a notice of no objection is given, the Contractor shall provide two copies of the document for use by the Engineer.

1.6.3 Permanent Works, Temporary Works, Contractor's Equipment, Hardware, Firmware, software, apparatus of all kinds, and, where appropriate, materials and workmanship shall be in accordance with the Standards quoted in the Specification and the requirements identified in the PS or, where no Standard is identified, the Contractor shall make a proposal which shall be subject to review by the Engineer.

1.7 Employer's Drawings

1.7.1 The Employer's Drawings assist in general describing the scope of the Works and clarify constraints, interface arrangements and to define the nature of the finished structures/system outline.

1.7.2 The Contractor shall carefully check all Employer's Drawings and advise the Engineer of discrepancies, omissions, errors or ambiguities should any be found.

1.7.3 The Contractor shall note that any drawings included but marked "For information only" do not form part of the Contract.

1.7.4 Dimensions shall not be obtained by scaling from the Employer's Drawings. Dimensions that are not shown or are not calculable from dimensions shown on Employer's Drawings shall be obtained from the Engineer.

1.8 Specifications in Metric and Imperial Units

1.8.1 Specifications in imperial units shall not be substituted for specifications in metric units stated in the Contract without the prior consent of the Engineer.

1.8.2 Conversion of metric units to imperial units and of imperial units to metric units shall be in accordance with the Standard International Practice.

1.9 System Safety

1.9.1 Safety philosophy

1.9.1.1 Safety of passengers, staff and the general public is paramount for railway operation. Prime consideration shall be given to all issues that can have an effect on safety.

1.9.1.2 During the construction phase the safety of all staff involved in the Works and any members of the general public affected by the Works shall be the prime feature of all working methods, including storage and transport to site as well as all temporary works not incorporated into the final construction.

1.9.2 Safety Management

The Contractor shall implement the Contract Systems Safety Management Requirements, as referenced in the Project Safety Manual and elsewhere in the tender document, in consultation with the Engineer.

1.9.3 Prescriptive Safety Criteria

1.9.3.1 The Contractor shall identify and list all applicable statutory and regulatory requirements and codes of practice relevant to the installation of the works undertaken and to work within the constraints and limitations imposed by the requirements and codes.

1.9.3.2 The safety of the Contractor's supplied systems and equipment shall be developed by the Contractor in accordance with the requirements contained in clause 3.4.4 below and the PS.

1.10 Suitability for Purpose

Jaipur Metro Rail Corporation (JMRC) shall be operating high-density passenger trains with high volume of traffic in the proposed corridors commensurate with the stage opening of the sections.

1.10.1 Interference and Compatibility

The Contractor shall ensure that all Works and Contractor's Equipment operate in a satisfactory manner without causing interference to other equipment and services including parties external to the Employer. The Contractor shall also ensure that the Permanent Works are physically and technically compatible with associated plant and in particular with that of other Contractors.

1.11 Climatic Condition / Operating Environment

1.11.1 General

1.11.1.1 The following information on climatic conditions in Jaipur shall be taken into account by the Contractor. The Contractor shall ensure that due allowance is made for more severe local conditions when Permanent Works are required to operate, for example, with restricted ventilation that may lead to higher local ambient temperatures, and any other factors that may affect the operating environment in any way.

(1) Unless specific figures are provided elsewhere, the Permanent Works will generally be required to function at its rated value with the values of ambient temperature and relative humidity appropriate to the location. Certain parts of the Permanent Works may need to be rated for more or less onerous conditions as required by the PS.

(2) Clause 1.11.2 below gives the different classifications of environment to be encountered. For any type of item, examples of which are installed in more than one environmental class, all examples of the type shall be suitable for installation in the most severe environmental class conditions encountered by any example of the type.

(3) The Contractor's attention is drawn to the more severe environmental conditions that may exist during the construction period and shall take adequate measures to protect the Permanent Works against any deleterious effects of such conditions during the time between installation and final completion of the Project.

(4) The indicative information on climatic conditions in Jaipur is derived from the India Meteorological Department publication "Climate of Rajasthan.

1.11.2 Details of Environment

Daily maximum and minimum temperature during winter, summer and rainy season (ever recorded):

	Max	**Min**
Winter (November to February)	35°C	-0.6^{o}C
Summer (March to June)	47.2^{o}C	4.4^{o}C
Rainy (July to October)	45°C	9.4^{o}C

1.11.2.1 Wind Pressure

The system is to be designed to give satisfactory service for a wind pressure as per relevant IS codes applicable

1.11.2.2 Sunshine and other meteorological details

Sunshine hours and other meteorological details can be obtained by placing a specific request to Meteorological Department.

1.11.2.3 Relative Humidity

Daily maximum and minimum average values during winter, summer and rainy season.

	Max	**Min**
Winter	72%	28%
Summer	48%	16%
Rainy	77%	35%

1.12 Survey and Site Investigations

1.12.1 For reference to surveys external to the Contract, the Contractor shall refer all Levels to Mean Sea Level (MSL) Datum, which is that generally used throughout Jaipur.

1.12.2 The datum used for the Contract shall be Mean Sea Level Datum.

1.12.3 The Contractor shall carry out all further site investigations necessary for the Permanent Works and to enable the determination of the methods of construction and the nature, extent and design of Temporary Works.

* End of Chapter *

CHAPTER 2

2. PLANNING, PROGRAMME AND PROGRESS MONITORING

2.1 Planning

2.1.1 The Contractor shall develop in detail, a logical method of executing the Works taking into account their complex nature and different phases and shall provide programmes which reflect the detailed planning undertaken.

2.1.2 The programmes, shall start with the Commencement Date of the Works as day one. The programme are to be realistic, achievable as per key date given in PS and shall be accompanied by the detailed supporting Plans referred to in Chapter 3 below.

2.2 Programming General Requirements

2.2.1 Programme activities shall be discrete items of work, which when combined, produce definable elements, components, Stages and Sections of the Works and clearly identify the completion obligations of the Contractor

2.2.2 Key Dates shall be an integral part of all programmes and all activities, and sequencing and interrelationships required to achieve each completion obligation shall be shown.

2.2.3 The critical path shall be clearly identified in the programme and fully described in the accompanying programme narrative.

2.2.4 Activity descriptions shall clearly convey the nature and scope of the Works. Programmes shall take into account the activities of precursor, concurrent, adjacent and follow on Project Contractors as well as utility service diversions, new utilities and connections and any other activity that may affect the progress of the Works.

2.2.5 The Contractor shall also incorporate the Engineer's requirements for additional activities, to further explain or subdivide complex or long duration tasks, without affecting completion dates.

2.3 Progress Monitoring

The Contractor shall monitor its and its subcontractors' performance and against programmes to ensure its compliance with its obligations under the Contract. Monitoring of the Works shall include direct, daily monitoring of the progress of the Works and the preparation of written and computerised reports to be submitted to the Engineer/Employer. The reports shall include all necessary supporting data to apprise the Engineer of the status of the completion of the Works as described in clause 2.10 below.

2.4 Works Programme

The Works Programme to be submitted under the Contract shall be developed from the Outline Works Programme submitted and developed during the Tender period.

2.4.1 Submission Dates

2.4.1.1 Within 7 days of the Commencement Date of the Works, the Contractor shall submit for review by the Engineer, his proposed initial version of the Works Programme which shall provide full programme details for the complete period of the Contract.

2.4.1.2 Within 21 days of the Commencement Date of the Works, the Contractor shall submit for review by the Engineer the proposed full version of the Works Programme.

2.4.1.3 Should the Contractor fail to submit the initial and full versions of the Works Programme within the time scales nominated above the Employer may nominate the Outline Works Programme as the first issue of the Works Programme required under the Contract.

2.4.1.4 In the event that the Employer does nominate the Outline Works Programme as the first issue of the Works Programme under the Contract the Engineer may include any amendments that he sees fit to change external constraining dates, duration of activities by parties other than the Contractor and subdivide the Contractors own activities to provide additional detail and links to other activities but without altering the duration or sequencing of the activities shown on the Outline Works Programme.

2.4.1.5 Any either initial or final Works Programme resulting from a nomination by the Employer of the Outline Works Programme as amended shall be taken by the Contractor as his own work and any responsibility for further maintenance of the Works Programme as nominated shall remain the Contractor's.

2.4.2 Content

2.4.2.1 The Works Programme shall demonstrate by reference to its Sub-Programmes, Supplementary Programmes and associated Management Plans, the sequence and duration of activities and any restraints thereto, that the Contractor shall adopt to achieve Key Dates and to fulfil all Contract obligations. The Works Programme shall become the Engineer's basis of administration of the time-related aspects of the Contract.

2.4.2.2 The Contractor shall provide the Engineer with substantiation for each constraint whether target start, target finish or mandatory constraint entered by the Contractor into the Works Programme. The number of constraints shall be kept to an absolute minimum in order that the CPM networks developed can be freely analysed.

2.4.2.3 The Works Programme shall include activities for all the phases and stages of the Works, clearly showing all logical interdependencies and stages in the development of the Contractor's procurement, installation, commissioning and setting to work. As a minimum, it shall include:

(1) all work comprising the Permanent Works;

(2) preparation and submission for review of mock-ups and prototypes;

(3) procurement of all major materials and items of Contractor's Equipment for the Works, including the dates orders are to be placed, manufacture period and the expected delivery date to the Site for each item;

(4) any software development requirements and Validation time frames;

(5) all manufacture or prefabrication of materials or components;

(6) all installation of major Temporary Works;

(7) all activities associated with the securing of necessary permits and other statutory approvals for the Works;

(8) access and availability dates for all Project Contractors;

(9) all interfaces related to the Project that may affect the progress of the Works;

(10) testing and commissioning activities which demonstrate an understanding of the interfaces and requirements of Chapter 8 below; and

(11) Training

2.4.2.4 The Works Programme shall be divided into Sub-Programmes of manageable sizes addressing in more specific detail, the content of the Management Plans as stated in Chapter 3 below. The Sub-Programmes shall be as follows:

(1) procurement and manufacturing programme;

(2) Installation Programme;

(3) Testing and Commissioning Programme; and

(4) Training

2.4.2.5 The submission of the full version of the Works Programme shall include the Procurement, Manufacturing Programme and Installation Programme and the Testing and Commissioning Programme identifying all major installation, testing activities and associated interfaces.

2.4.3 All programmes constituting the Works Programme shall be organised in a logical work breakdown structure including work stages or phases. Each activity shall be coded to indicate, as a minimum, the work group or entity responsible for the activity, the area, facility or location in which the activity is included, from information provided in the Pricing Document. Key Dates shall be coded so as to be separately identifiable. The Contractor may be required to assign additional activity codes as required by the Engineer.

2.5 Procurement and Manufacturing Programme

2.5.1 Within 15 days of the Commencement Date of the Works, the Contractor shall submit for review by the Engineer Procurement and Manufacturing Programme that shall be an integrated part of the overall Works Programme.

2.5.2 The Procurement and Manufacturing Programme shall show the interdependencies between engineering disciplines as well as between the Contractor and its sub-contractors and suppliers.

2.5.3 The Contractor shall submit a weighted bar chart of the Contractor's procurement and manufacturing activities. Each activity weight shall normally not be more than 5% of the total man-hour content or value of the respective work.

2.5.4 The Procurement and Manufacturing Programme shall include a separate breakdown, supported by the Material Control Schedule, which shall be a complete amplification of the Contractor's programme and equipment list, including those items which are subject to long lead time or component parts which are manufactured from countries outside the country of assembly and testing.

2.5.5 The Material Control Schedule shall detail the following information for each permanent major and minor material and significant component. The format of such a schedule shall include:

(1) name, description, supplier/sub-supplier details;

(2) drawing information (where appropriate), title, drawing status, submission dates, shop drawings/ fabrication drawing preparation, etc.;

(3) manufacturing test pieces, trial production, Engineer's inspection, monthly production of components and monthly supply of components;

(4) transport to dock, shipment;

2.5.6 The Contractor shall continuously maintain this schedule and report upon the status of each item as part of the Contractor's regular progress reporting.

2.5.7 From this base data, the Contractor shall prepare an exception report detailing all components that are in delay. This report shall be annotated with the reason for the delay and indicate what action the Contractor is taking to recover the lost time.

2.5.8 The Contractor shall submit, as part of the Procurement and Manufacturing Programme, a Factory Testing Programme that shall support all aspects of the Factory Testing Plan within 15 days of the commencement date of works.

2.5.9 The Factory Testing Programme shall be fully detailed, with activities individually identifying all tests for which a certificate will be issued, and shall include activities for preparation, submittal and review of the test procedures.

2.5.10 The Factory Testing Programme shall demonstrate the logical dependencies between the individual tests of the Works, and shall also show the interfaces and dependencies with the Contractor's delivery programme.

(1) The Factory Testing Programme shall include details of inspection, testing and witnessing of the Contractor's and subcontractor's procurement and manufacturing activities.

2.6 Installation Programme

2.6.1 The Installation Programme shall be submitted within 30 days of the commencement date of works in initial version. The final version of installation, programme shall be submitted as stated in PS or as directed by Engineer.

2.6.2 The Installation Programme shall include detailed activities describing all aspects of the installation of the Works. It shall be clearly linked to the Procurement and Manufacturing Programme and Testing and Commissioning Programme to form an integrated part of the Works Programme.

2.6.3 The Installation Programme shall be fully supported by the Construction and Installation Management Plan as specified in clause 3.6 below.

2.6.4 The Installation Programme shall indicate the physical areas to which the Contractor requires access, access date, duration required and the required degree of completion for civil or architectural finishes prior to the access date.

2.6.5 The Installation Programme shall take into account the requirements for arrival at port, delivery, storage, preservation and positioning of large items of Contractor's Equipment and Permanent Works and shall set out the Contractor's proposed delivery route for such items to the Site.

2.6.6 Installation Tests shall be clearly shown in the Installation Programme and shall include those interface tests required to be carried out by others to establish a timetable for these tests.

2.6.7 Activities that may be expedited by the use of overtime, additional shifts or by any other means shall be identified and explained.

2.6.8 In preparing the Installation Programme, the Contractor should note that the following conditions shall apply:

(1) the Contractor shall not have exclusive access to any part of the Site except by the specific consent of the Engineer;

(2) the Contractor shall take note that concurrent time allocations for certain areas may be given to more than one contractor. The Contractor shall co-ordinate the Contractor's work in such areas with that of Project designated Contractors through the Engineer;

(3) the absence of a programme date or installation period for the Contractor in a specific area shall not prejudice the right of the Engineer to establish a reasonable programme date or installation period for that area;

(4) the Contractor shall comply with the identified Key Dates.

2.7 Testing and Commissioning Programme

2.7.1 The preliminary version of testing and Commissioning Programme shall be submitted within 30 days of commencement date of works. The final version of testing and commissioning programme shall be submitted as stated in the PS or as directed by the Engineer.

2.7.2 The Contractor shall submit the Testing and Commissioning Programme that shall fulfil all the on-Site testing and commissioning requirements.

2.7.3 The Testing and Commissioning Programme shall be fully detailed, with activities individually identifying all tests for which a certificate will be issued, and shall include activities for preparation, submittal and review of the test procedures.

2.7.4 The Testing and Commissioning Programme shall demonstrate the logical dependencies between the individual tests of the Works, and shall also show the interfaces and dependencies with all of the Project Contractors' tests required to commission the Works and support the Commissioning Plan.

2.8 Training Programme

2.8.1 The Contractor shall, within 120 days of the Commencement Date of the Works, submit for review by the Engineer, a Training Programme covering all proposed formal training courses, delivery of training equipment

2.8.2 The Training Programme shall be developed to the Training Plan as required under clause 3.7.3 below.

2.9 Works Programme Revisions

2.9.1 The Contractor shall immediately notify the Engineer in writing of the need for any change in the Works Programme, whether due to a change of intention or circumstances or for any other reason. Where such a proposed change affects the timely completion of the Works or any Section or Stage; the Contractor shall within 14 days of the date of notifying the Engineer submit for the Engineer's review his proposed revised Works Programme and accompanying Programme Analysis Report. 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 on the Works and Project Contractors and their works.

2.9.2 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 Works Programme. Upon receipt of such a request the Contractor shall submit within 14 days a revised Works Programme, together with an accompanying Programme Analysis Report and Narrative Statement, that shall demonstrate the means by which the Contractor intends to eliminate the deviation.

2.10 Monthly Progress Report

2.10.1 The Contractor shall prepare Monthly Progress Reports covering all aspects of the execution of the Works. Such Monthly Progress Reports shall be in writing and shall be delivered to the Engineer and Employer by the 5th day of the month following the month of the Monthly Progress Report. The Monthly Progress Report shall take account of work performed up to and including the last day of the month to which the Monthly Progress Report relates.

2.10.2 The Monthly Progress Report shall include an executive summary and contain clear and concise statements in respect of every significant aspect of the Works including, without limitation, the requirements specified in Appendix 1 of this Specification.

2.10.3 The Monthly Progress Report shall contain evidence that documents and supports the progress of the Works, as stated in the Interim Payment Certificates, to the satisfaction of the Engineer.

2.10.4 The reports, documents and data provided shall be an accurate representation of the current status of the Works and of the work to be accomplished and shall provide the Engineer with a sound basis for identifying problems and deviations from planned work and for making decisions.

2.11 Key Date and Access Date

2.11.1 The Key Date and Access Date shall be prepared in a format reviewed by the Engineer and identify and state the status of :

(1) all Key Dates and Access Date that were planned to be achieved in the reporting period or earlier but have not been achieved;

(2) all Key Dates and Access Date that have been achieved in the reporting period;

(3) all Key Dates and Access Date that are planned to be achieved in the next reporting period; and

(4) any future Key Dates and Access Date that appear unlikely to be achieved on time.

2.11.2 The Key Date and Access Date shall identify, for all relevant Key Dates and Access Date, the planned dates, the actual dates achieved, and where the original planned dates are forecast to be unachieved, the revised dates identified in the Contract, as the same may be revised from time to time in accordance with the Contract.

2.11.3 The Key Date and Access Date shall also provide an explanation for any deviation from the planned dates. Measures taken or required to recover programme delays shall also be identified.

2.12 Progress Meetings

2.12.1 The Employer will chair progress meetings every month with the Contractor. These meetings will be held at dates and times to be advised by the Engineer. Progress meetings shall not be later than 10 days after the issue of the Contractor's Monthly Progress Report.

2.12.2 The Engineer may convene at his discretion, at any time upon reasonable notice to the Contractor, any meeting, either on or off the Site, to discuss and address any aspect of the Works or the Contract. he Contractor shall attend any such meetings convened by the Engineer.

2.12.3 All meetings shall be convened in JAIPUR unless directed otherwise by the Engineer. Meetings shall be attended by senior personnel from the Contractor who shall arrive properly briefed for all aspects of the meeting and shall be empowered to make executive decisions in respect of the execution of the Works.

* End of Chapter*

CHAPTER 3

3. MANAGEMENT PLANS AND SUBMISSIONS

3.1 General

3.1.1 In order to organise the various submissions required by the Engineer, and to ensure the Contractor's understanding and compliance with the requirements of the Contract, a series of Management Plans shall be developed. These Management Plans will serve to structure the submittals in a manner that the Contractor can develop and prepare the submittals and the Engineer can review and comment on a prescribed programme.

3.1.2 The Management Plans shall be configured as a family of "stand-alone" plans and associated documents each covering one of the subjects listed below.

The plans and documents shall be co-ordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organisation, sequencing of activities, etc. and shall show how these combine together to assure that the Works truly meet the requirements of the Specification in respect of the subjects listed.

Unless otherwise stated in the PS, all plans and documents shall be submitted in preliminary form within 15 days of the Commencement Date of the Works followed by detailed plans within 30 days of the preliminary submission. Further submissions shall be made:

(1) when required in accordance with the Works Programme;

(2) in response to comments made by the Engineer in accordance with clause 4.3.6 below;

(3) whenever any change occurs that invalidates the information contained in the previously submitted and reviewed document, within 14 days of the occurrence of such change; and

(4) when requested by the Engineer from time to time.

3.2 General Organisation

3.2.1 The Plans listed below shall be developed and submitted by the Contractor for the Engineer's review:

- **Project Management Plan**
  - **Contractor's Project Plan**
  - **Interface Management Plan**
- **Systems Assurance Plans**
  - **Quality Plans**
  - **Safety Plans**
- **Procurement, Manufacturing and Delivery Plan**

- **Construction and Installation Management Plan**
- **Construction and Installation Plan**
- **Health and Safety Documentation**
- **Environmental Qualities Management Plan**
- **Traffic Management Submissions** (if required)
- **Completion Management Plan**
- **Commissioning Plan**
- **Training Plan**
- **Defects Liability Management Plan**

3.3 Project Management Plan

The overall management of the Works shall be the Contractor's responsibility. The organisation of the resources for the procurement, manufacture, delivery, installation, testing and commissioning, and setting to work is to be developed into a Project Management Plan. Each section of this plan shall fully describe the Contractor's understanding of the Works and management skills and structure required to achieve the same.

3.3.1 Contractor's Project Plan

3.3.1.1 The Contractor's Project Plan shall provide a clear overview of the Contractor's organisation, management systems and methods to be used for the complete execution of the Works.

3.3.1.2 The Contractor's Project Plan shall include a summary description of each and every stage of implementation of the Works, clearly showing the principal organisational interfaces both within the Contractor's own organisation (including sub-contractors of every tier) and with Other Contractors and Relevant Authorities, defining how each of these interfaces is to be managed and controlled. An organisation chart shall be produced to illustrate the subdivision of the work into elements for effective technical and managerial control, the reporting structure and the interface relationship among all parties involved. Names, addresses, telephone and fax numbers of all principal contacts shall be listed.

3.3.1.3 The Contractor's Project Plan shall contain structured organisation charts showing the hierarchical relationship of the Contractor's organisation (including sub-contractors of every tier). The organisation charts shall be produced as a "family" such that the basic chart shows the overall organisation structure supported by subsidiary charts detailing the internal structure of the various departments or sections of the overall organisation.

3.3.1.4 The Contractor's Project Plan shall include full details of the qualifications, experience, authority and responsibility of the personnel assigned to all key positions of the Contractor's organisation (including sub-contractors of every tier). As a minimum, this shall include all levels down to senior managers and shall include the personnel responsible for each individual department and functional group. A clear reference shall be given as to the location of staff (e.g. Site resident or factory based, etc.). Names, addresses, telephone and fax numbers of all principal contacts shall be listed.

The Contractor's Project Plan shall define the Contractor's management structure for the execution of the Works and for the control of the quality of the Works and shall, without limitation, identify and set out;

(1) the procedures for the control of receipt and issue of all Works related correspondence so as to ensure traceability;

(2) the procedures for the identification, production, verification, internal approval, review (when required) by the Engineer, distribution, implementation and recording of changes to all drawings, reports and specifications;

(3) the procedures for the control, calibration and maintenance of inspection, testing and measuring equipment;

(4) the procedures for the control of non-conformity.

3.3.1.5 Particulars of Contractor's Representative

(1) The Contractor shall give and provide all necessary supervision during the execution of the Works as long as the Engineer considers necessary for the proper fulfilment of the Contractor's obligations under the Contract.

(2) The Contractor shall ensure that he is at all times represented on the Site by a competent and authorised English/Hindi speaking Contractor's Representative who shall be deemed to have been reviewed without objection by the Engineer provided such Contractor's Representative is not expressly objected to by the Engineer in writing within 14 days from the service of a notice upon the Engineer by the Contractor of the appointment of such Contractor's Representative. Such Contractor's Representative shall be constantly on the Site and shall give his full time to the superintendence of the Works.

(3) Such authorised Contractor's Representative shall receive on behalf of the Contractor directions and instructions from the Engineer.

(4) The following particulars of the proposed Contractor's Representative shall be submitted to the Engineer for review:

(i) name;

(ii) copy of Identity Card;

(iii) details of qualifications, including copies of certificates; and

(iv) details of previous experience.

(5) The particulars of the Contractor's Representative shall be submitted 30 days before the agreed scheduled start of that part of the Works. Except in the case of a replacement agent (as provided for in clause 3.3.1.5.), in which case the said particulars shall be submitted forthwith.

(6) The Contractor's Representative shall possess relevant academic or professional qualification and have at least 10 years experience in relevant engineering works. The Engineer reserves the right to call upon the Contractor to prove such qualifications/experience to the satisfaction of the Engineer.

(7) The minimum qualification of the Contractor's Representative shall be as approved by the Engineer based on nature/importance of the work and experience of the person.

3.3.2 Interface Management Plan

a) The Contractor shall interface and liase with other Contractors in accordance with the requirements of clause 12.3 below.

b) Within 30 days of notification from the Engineer of the identity of each Other Contractor, the Contractor shall develop and submit to the Engineer an Interface Management Plan that is mutually acceptable to both the Contractor and the other Contractors. The Interface Management Plan shall:

(1) identify the sub-systems as well as the civil works and facilities with interfacing requirements;

(2) define the authority and responsibility of the Contractor's and other Contractors' (and any relevant sub-contractors') staff involved in interface management and development;

(3) identify the information to be exchanged, together with the management and technical skills required for the associated development work, at each phase of the Contractor's and other Contractors' (and any relevant sub-contractors') project life-cycles;

(4) include considerations of the Interface Hazard Analysis;

(5) specify the configuration and version control procedures in accordance with the Contractor's and other Contractors' (and any relevant sub-contractors') quality management system; and

(6) address supply, installation, testing and commissioning programme of the contracts to meet the key dates of each contract, and highlight any programme risks requiring management attention.

c) Once the Interface Management Plan has been reviewed without objection by the Engineer, the Contractor shall execute the Works in accordance with the Interface Management Plan. The Contractor shall advise the Engineer immediately of any difficulty in developing a mutually acceptable Interface Management Plan.

d) Within 30 days of notification from the Engineer of the identity of each Other Contractor, the Contractor shall develop and submit to the Engineer for review a Detailed Interface Document for each Other Contractor that is mutually acceptable to both contractors. The Detailed Interface Document shall address in detail how the dates identified in the Interface Management Plan shall be achieved and shall identify the data required by the interfacing other Contractors to meet the requirements of the PS.

e) The Detailed Interface Document shall specify the proposed method and schedule for verifying the interface integrity, the individual equipment/system performance and the combined system performance. The Detailed Interface Document shall include a programme of tests to demonstrate the performance and integrity of

the integrated systems. The Interface Specification appended to the PS shall form the basis of the Detailed Interface Document, but does not relieve the Contractor's obligation to identify any new interface to meet the Contract requirements. Any revision to the Detailed Interface Document shall be mutually acceptable by contractors and submitted to the Engineer for review.

3.4 Systems Assurance Plans

3.4.1 The Systems Assurance Plans shall be submitted for review to the Engineer in Preliminary and Final forms.

3.4.2 The various plans shall be co-ordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organisation, sequencing of activities, etc. and shall show how these combine together to assure that the Works truly meet the requirements of the Specification in respect of the subjects listed.

3.4.3 Quality Plans

The Contractor shall submit for review by the Engineer quality plans in accordance with the requirements of clause 5.2 below.

3.4.4 Safety Plans

3.4.4.1 Site Safety Plan

3.4.4.1.1 The Contractor shall prepare a Site Safety Plan incorporating the requirements of the Project Safety Manual and designed specifically for the various sites (including storage and overseas sites) on which work under the Contract is carried out.

3.4.4.1.2 The Site Safety Plan shall form a part of the Health and Safety Documentation referred to in Chapter 14 below.

3.5 Procurement and Manufacturing Plan

The Procurement and Manufacturing Plan shall be configured as a family of "stand-alone" plans and associated documents each covering one of the subjects listed below. The plans shall be co-ordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organisation, sequencing of activities, etc. and shall show how these combine together to assure that the Works fully meet the requirements of the Specification in respect of the subjects listed.

3.5.1 Procurement, Manufacturing and Delivery Plan

3.5.1.1 The Contractor shall prepare procurement, manufacturing and delivery plans in respect of all items and goods. Separate parts of the plan shall be prepared for Contractor or sub-contractor off-Site activities. Each plan shall identify the scope of work to be applied. In relation to such scope of work, it shall, without limitation, define:

(1) the organisation of the Contractor's staff directly responsible for the day-to-day management of the manufacturing activity on or off the Site;

(2) the specific allocations of responsibility and authority given to identified personnel for the day-to-day management of the work with particular reference to the supervision, inspection and testing of the work;

(3) the interfacing or co-ordination required with the Contractor's other related plans;

(4) the specific methods of manufacture to identify any relevant method statements and develop those method statements to a degree of sufficient detail reviewed by the Engineer; and

(5) the list of procedures and work instructions to manage and control the quality of work during purchasing, manufacturing and delivery, including without limitation:

a) the purchasing of items and goods and ensuring they comply with the requirements of the Specification, including (without limit) purchasing documentation and specific Verification arrangements for Contractor /Engineer inspection of material or manufactured product prior to release for use;

b) the manufacturing process so as to ensure compliance with the design;

c) the manufacturing process so as to ensure clear identification and traceability of material and manufactured parts;

d) the inspection and testing of incoming materials, in process and final product so as to ensure specified requirements for the material and/or manufactured product are met;

e) the identification of the inspection and test status of all material and manufactured products during all stages of the manufacturing process to ensure that only products that have passed the required inspections and tests are dispatched for use and/or installation;

f) review and disposal of non-conforming material or product so as to avoid unintended use;

g) the assessment and disposal of non-conforming material and manufactured product and approval for reworking or rejection as scrap;

h) the identification of preventive action so as to prevent recurrence of similar non-conformance; and

i) the handling, storage, packaging, preservation and delivery of manufactured product.

3.5.1.2 The Contractor shall prepare and submit the inspection and testing plans to manage and control any test and inspection activities.

3.5.1.3 The Contractor shall propose a structured set of inspection hold points. The hold points shall be structured such that a formal hold point is allowed for each significant element of the manufacturing process. At each hold point, the Engineer shall hold a formal inspection or advise that the inspection has been waived.

3.5.1.4 Once the inspection and any required remedial actions are completed to the satisfaction of the Engineer, the Engineer shall give a notice of no objection for unit shipment. The Engineer will not withhold his notice of no objection for shipping unreasonably, provided all pre-delivery assembly and testing has been successfully completed.

3.5.1.5 Any unit delivered without the Engineer's notice of no objection shall be rejected at the Site and all expenses thereby incurred shall be borne by the Contractor.

3.6 Construction and Installation Management Plan

The Construction and Installation Management Plan shall be configured as a family of "stand-alone" plans and associated documents each covering one of the subjects listed below.

The plans shall be co-ordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organisation, sequencing of activities, etc. and shall show how these combine together to assure that the Works truly meet the requirements of the Specification in respect of the subjects listed.

3.6.1 Construction and Installation Plan

3.6.1.1 The Contractor shall prepare plans for the construction and installation activities on and off the site, as referenced in clause 10.1.1 below, and shall ensure that these are properly related to the subsequent testing and commissioning activity.

3.6.1.2 Separate parts of the plan shall be prepared for other contractor(s) or sub-contractor(s) off-site activities.

3.6.1.3 Each construction plan shall identify the scope of activity to be controlled. In relation to such scope of activity, it shall, without limitation, define:

(1) the organisation of the Contractor's staff directly responsible for the day-to-day management of the activity on or off the Site;

(2) the specific allocations of responsibility and authority given to identified personnel for the day-to-day management of the Works with particular reference to the supervision, inspection and testing of the Works;

(3) the interfacing or co-ordination required with the Contractor's other related plans;

(4) the specific methods of construction and installation to identify any relevant method statements and develop those method statements to a sufficient degree of detail reviewed by the Engineer;

(5) a detailed method statement which shall include but not be limited to:

a) description of main operations and sub-operations;

b) sequence of sub-operations;

c) quantities of the work and production rates to be achieved;

d) resources to be employed; and

e) quality checks to be carried out, supervision being exercised and safety precautions to be employed;

(6) the list of procedures and work instructions to manage and control the quality of construction and installation works, including without limitation:

a) the inspection and testing activities of incoming materials, in process and final product so as to ensure specified requirements for the material and/or product are met;

b) the purchasing of materials and ensuring they comply with the requirements of the Specification, including purchasing documentation and specific Verification arrangements for Contractor/Engineer inspection of material or manufactured product prior to release for use/installation;

c) the construction processes including Temporary Works so as to ensure compliance with drawings and Specification. In addition, any software to be used in the construction, installation and commissioning process shall be identified and details of the Verification and Validation processes for the software application shall be given;

d) the construction and installation process so as to ensure clear identification and traceability of material and manufactured product;

e) the identification of the inspection and test status of all material and manufactured products during all stages of the construction and installation process to ensure that only products that have passed the required inspections and tests are despatched for use and/or installation;

f) review and disposition of non-conforming material or product so as to avoid unintended use/installation;

g) the assessment and disposition of non-conforming material and product and approval for reworking or rejection as scrap;

h) the identification of preventive action so as to prevent recurrence of similar non-conformance; and

i) the handling, storage, packaging, preservation and delivery of product; and

(7) the security control of the Site and the works area for Contractor's accommodation, storage, car park and other works facilities, etc. in accordance with clause 11.10 below.

3.6.1.4 The Contractor shall prepare and submit the inspection and test plans to manage and control any test and inspection activities in accordance with clause 5.6.1 below.

3.6.1.5 Where all or part of the Works is within the DMRC Protection Zone, the Contractor shall follow the guidelines issued by the Employer's appropriate authority. The Contractor shall submit to the Engineer for review his construction method statement and detailed design of any Temporary Works proposed to be erected within this zone adjacent to DMRC properties.

3.6.1.6 The following particulars shall be submitted to the Engineer for review within 14 days of the Commencement Date of the Works:

(i) drawings showing the layout within the Site of the Engineer's and Contractor's accommodation, Project signboards, access roads and major facilities required early in the Contract;

(ii) drawings showing the layout and the construction details of the Engineer's accommodation; and

(iii) drawings showing the details to be included on Project signboards.

3.6.1.7 Drawings showing the location of stores, storage areas, work areas and other major facilities shall be submitted to the Engineer for review as early as possible, but in any case not later than 28 days before construction of the facilities.

3.6.2 Health and Safety Documentation

3.6.2.1 The Contractor shall submit Health and Safety Documentation to fully comply with the requirements of the Project conditions and proposed work activities in accordance with Chapter 14 below.

3.6.2.2 The Contractor shall submit to the Engineer the Health and Safety Documentation for review within 30 days of the Commencement Date of the Works.

3.6.3 Environmental Qualities Management Plan

3.6.3.1 The Contractor shall submit an Environmental Plan based the Outline Environmental Plan submitted and adapted during the Tender period. The Environmental Plan shall comprise a set of Environmental Plans as detailed below:

- **Environmental Management Plan**;
- **Environmental Mitigation Implementation Schedule** (if required); and
- **Traffic Management Submissions**.

3.6.3.2 Environmental Plans shall include the Contractor's proposed means of complying with his obligations in regard to:

a) The Site Environment as found; and

b) System Environment as described in the Specification.

The Environmental Plan shall include as required detailed policies, procedures and applicable regulations.

3.6.3.3 Environmental Management Plan

3.6.3.3.1 The Contractor shall submit for review by the Engineer, an Environmental Management Plan (EMP) which will set out in detail the approach for dealing with each of the potential environmental impacts arising from the various different construction activities.

3.6.3.3.2 The EMP shall address all the potential impacts outlined in the Employer's Final Assessment Report and shall follow the EMP Outline.

3.6.3.3.3 The Contractor shall submit the final EMP, for review by the Engineer, 30 days prior to the commencement of construction activities.

3.6.3.4 Environmental Mitigation Implementation Schedule

3.6.3.4.1 The Contractor shall submit for review an Environmental Mitigation Implementation Schedule (EMIS) which is a plan for the provision of the mitigation measures identified in the EMP.

3.6.3.4.2 The Contractor shall submit the EMIS, for review by the Engineer in conjunction with the EMP, 30 days prior to the commencement of construction activities.

3.6.3.5 Traffic Management Submissions

Where the Contractor is required to become involved with traffic or footpath management activities, submissions shall be made by the Contractor for the Engineer's review 30 days before implementation proving all relevant details and implications.

3.7 Completion Management Plan

3.7.1 The Contractor shall organise the services required under the Contract to bring the Works into service under one plan. This co-ordinated approach shall allow the Engineer the ability to review all aspects of the Works and services in an integrated manner.

The Completion Management Plan shall be configured as a family of "stand-alone" plans and associated documents each covering one of the subjects listed below.

The plans shall be co-ordinated with each other and shall collectively define, describe and encompass the Contractor's proposed methods, procedures, processes, organisation, sequencing of activities, etc. and shall show how these combine together to assure that the Works truly meet the requirements of the Specification in respect of the subjects listed.

Unless otherwise stated, all plans and documents shall be submitted in preliminary form within 15 days of the Commencement Date of the Works followed by detailed plans within 15 days of submission. Further submissions shall be made:

(1) when required in accordance with the Contractor's Works Programme;

(2) whenever the development of the Contractor's planning requires the plan to be developed further;

(3) in response to comments made by the Engineer in accordance with clause 4.3.6 below;

(4) whenever any change occurs that invalidates the information contained in the previously submitted and reviewed document, within 15 days of the occurrence of such change; and

(5) when requested by the Engineer from time to time.

3.7.2 Commissioning Plan

3.7.2.1 The Contractor shall ensure the timely preparation of the Commissioning Plan. The Contractor shall submit the first draft of the Commissioning Plan to the Engineer within 120 days of the Commencement Date of the Works.

3.7.2.2 The Commissioning Plan shall consist of the following:

a. Factory Testing Plan

b. On-Site Testing and Commissioning Plan

(i) **Installation Tests** Schedule

The Contractor shall submit to the Engineer a comprehensive schedule of Installation Tests as required by clause 8.1.5 below and the PS and in accordance with the Installation Programme as stated in clause 2.6 above. The schedule shall be submitted within the period of time laid down in the PS, or, if none is given, not later than two months in advance of the date for the commencement of the Installation Tests.

(ii) **Integration Testing & Commissioning Plan**

The Contractor shall submit to the Engineer a comprehensive Integrated Testing & Commissioning Plan including all requirements detailed in clause 8.1.6 below and the PS. The plan shall be submitted within the period of time laid down in the PS, or, if none is given, not later than three months in advance of the date for the commencement of the Integrated Testing & Commissioning.

3.7.3 Training Plan

3.7.3.1 The Contractor shall ensure the timely preparation of the Contractor's Training Plan in a format and to a level of detail reviewed without objection by the Engineer.

3.7.3.2 The Contractor shall submit the Training Plan by the date stated in the PS, or, if none is given, not less than six (6) months prior to the issue of the Taking Over Certificate for the Works and also to suit the staged commissioning of the relevant systems.

3.7.4 Defects Liability Management Plan

The Contractor shall submit for review by the Engineer a Defects Liability Management Plan to repair, replace and perform any remedial item upon the Works identified by the Engineer during the Defects Liability Period (DLP). The first submission of this plan is required upon issuance of the Taking Over Certificate for the Works. The Contractor shall:

(a) endeavour to complete all necessary work in a timely responsible manner;

(b) not proceed with any remedial work without the consent of the Engineer;

(c) submit a plan that details the methods and timing of any proposed work; and

(d) update the plan monthly, showing progress of the work and the time to completion.

(e) Plan will show key persons of the contractor to be deployed during DLP.

* End of Chapter *

CHAPTER 4

4. DOCUMENTS SUBMISSION AND REVIEW

4.1 Documents, Submissions and Correspondence

Copies of correspondence relevant to the execution of the Works and not of a confidential nature received from or despatched to Government departments, utility undertakings and Project Contractors employed by the Employer shall be submitted to the Engineer for information as soon as possible but in any case not later than 7 days after receipt.

4.2 Submissions to the Engineer

4.2.1 General requirements

4.2.1.1 All submissions shall be made to the Engineer in a format reviewed without objection by the Engineer and in accordance with the requirements in:

(1) the Contract;

(2) the Computer Aided Design & Drafting (CADD) Manual; and

(3) the Document Submittal Instructions to Contractors.

4.2.1.2 Paper and drawing sizes shall be "A" series sheets as specified in BS 3429.

4.2.1.3 The following software (versions quoted or higher) 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, Ver. 7.0
Spread Sheets	MS Excel, Ver. 7.0
Data Base Files	MS Access, Ver. 7.0
Presentation Files	MS PowerPoint, Ver. 7.0
Programmes	Primavera for Windows, Ver. 2.0b
AutoCAD Graphics	CorelDraw ,Ver. 7.0/ AutoCAD ver.14
Photographic	Adobe PhotoShop, Ver.4.0

Media for Electronic File Submission

One copy shall be submitted unless otherwise stated.

Internet File Formats/Standards

The following guidelines shall be followed when the Contractor uses the Internet browser as the communication media to share information with the Employer.

All the data formats or standards must be supported by Microsoft Internet Explorer version 3 or above running on Windows NT and Windows 95.

The following lists the file types and the corresponding data formats to be used on Internet. The Contractor shall comply with them unless the Engineer has previously reviewed without objection the Contractors proposal to adopt an alternative:

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)
Project documents	refer to the document type in clause 4.2.1.3 above
Video	Window video (.avi)
Sound	Wave file (.wav)

The following states the standards to be used on Internet when connecting to database(s). The Contractor shall comply with them unless the Engineer has previously reviewed without objection the Contractors proposal to adopt an alternative:

Function to be Implemented	Standard to be Complied With
Database connectivity	Open Database Connectivity (ODBC)
Publishing hypertext language on the World Wide Web	Hypertext Mark-up Language (HTML)

4.2.1.4 The hard copy of all documents shall be the contractual copy.

4.2.1.5 If required, two copies of all internal and external orders placed by the Contractor for equipment or materials required for the Works shall be forwarded to the Engineer at the time of issue. All orders shall state the Engineer's requirements for inspection and testing, shall bear the Contract reference, Contractor's name and address and shall indicate, where applicable, the sub-section of the Works for which the equipment or material is required.

4.2.1.6 Distribution of copies of the orders shall be in accordance with the Engineer's instructions.

4.2.1.7 The Contractor shall have the obligation to upgrade, at his own cost, all the relevant software to the latest version upon instruction by the Engineer, after the new version of the relevant software has been launched for more than six months in Jaipur.

4.2.1.8 The Contractor shall submit a drawing register to the Engineer in electronic copy and hard copy with each submission of drawings and at an interval agreed by the Engineer. The drawing register shall be in a format submitted for review and agreed without objection by the Engineer and shall include each document reference number, version, date, title and data-file name.

4.2.1.9 Specific additional requirements in respect of the numbering scheme shall be as defined in the PS.

4.2.2 Content

4.2.2.1 Unless otherwise specified or permitted by the Engineer, each submission shall comprise:

(1) for drawings - one A1 master on vellum (signed by the contractor), one A1 copy on vellum, one paper A1 copy, six paper A3 copies and an electronic data copy of all drawings; and

(2) for documents - the unbound original, six bound copies and an electronic copy when applicable.

4.2.2.2 The A3 copies of drawings shall be produced as reduced versions of the A1 original.

4.3 Records and Reports

4.3.1 Reports and records that are to be submitted to the Engineer shall be in a format reviewed by the Engineer. Reports and records shall be signed by the Contractor's agent or by a representative authorised by the Contractor.

4.3.2 Within 15 days of the Commencement Date of the Works, the Contractor shall submit a Project document control procedure to the Engineer for review, which shall include but not be limited to the following:

(1) a document approval system which shall specify the level of authority for approval of all documents and material before submission to the Engineer;

(2) a system of issuing documents to ensure that pertinent documents are issued to all appropriate locations;

(3) a document change or re-issue system to ensure that only the latest revision of a document can be used; and

(4) a submission identification system which identifies each submission uniquely by the following:

(a) contract number;

(b) discipline;

(c) submission number; and

(d) revision indicator.

4.3.3 Project records will eventually be used by the Employer to manage, operate and maintain the Works after the completion of the Project under construction and for future reference.

4.3.4 The Contractor shall submit the documents as required by the Engineer as Project records in full and on time. The Engineer shall determine the adequacy of the Project record.

4.3.5 Submission and review procedure

4.3.5.1 Except where specific procedures are given for certain items, all submissions shall be submitted and reviewed according to the procedure laid down in the following clauses.

4.3.5.2 Each submission shall be accompanied by a brief introduction to explain which sub-system, part or Section of the Works to which the submission refers, listing the documents enclosed with the submission, and describing in outline how all relevant requirements of the Specification are achieved by the proposals.

4.3.5.3 For each stage of submittal, the Contractor shall prepare a Submission Review Request (SRR) carrying the date of submission, the submission reference number as defined in clause 4.3.2.(4) above, the submission title, the stage of submission and the authorised signature of the Contractor's responsible engineer in the format shown in Appendix 3 of this Specification, to confirm that, in the opinion of the Contractor, the submission:

(1) complies with all relevant requirements of the Specification;

(2) conforms to all interface requirements;

(3) contains, or is based on auditable and proven or verified calculations or design criteria;

(4) has been properly reviewed by the Contractor, according to the Contractor's QA system, to confirm its completeness, accuracy, adequacy and validity; and

(5) has taken account of all requirements for approval by statutory bodies or similar organisations, and that where required, such approvals have been granted.

4.3.5.4 The Engineer's response to the submission will normally be made within 30 calendar days of receipt of the submission. The Engineer may extend the review period depending on the amount of documentation accompanying the submission.

4.3.6 Engineer's Response

4.3.6.1 The Engineer will respond in one of the following three ways:

(1) " Reviewed without Objection"

(2) "Reviewed without Objection, Subject to"

(3) "Rejected"

4.3.6.2 If the Engineer, having reviewed the submission, has not discovered any non-compliance with the Contract, the SRR will be returned endorsed with the Engineer's signature and the words "Reviewed without Objection". Receipt of such notice of no objection does not in any way imply the Engineer's approval of the submission, nor does it remove any responsibility from the Contractor for complying with the Contract. Issue of a "Notice of No Objection" entitles the Contractor to proceed to the next stage of the programme of work.

4.3.6.3 If the Engineer discovers minor non-compliance, discrepancies, omissions, etc. that, in his opinion, are not of a fundamental nature, he may return the SRR endorsed with the Engineer's signature and the words "Reviewed without Objection Subject to", and including a list of the features that are required to be amended, included or improved to comply with the Contract. Issue of a "Notice of No Objection Subject to" entitles the Contractor to proceed to the next stage of the programme of work provided that all of the Engineer's comments are taken into account fully and implemented exactly.

4.3.6.4 If the Engineer issues a "Notice of No Objection Subject to", the Contractor shall resubmit the affected parts of the submission, clearly demonstrating how the Engineer's comments have been taken into account and resubmit amended or corrected material within 10 working days of issue of the Engineer's comments, using the process described in clause 4.3.5 above.

4.3.6.5 If the Engineer discovers major non-compliance, discrepancies, omissions, etc. that, in his opinion, are of a fundamental nature, he may return the SRR endorsed with the Engineer's signature and the word "Rejected", and including a list of the features that are required to be amended, included or improved to comply with the Contract. Issue of a "Notice of Rejection" does not entitle the Contractor to proceed to the next stage of the programme of work until all of the Engineer's comments are fully taken into account and a satisfactory re-submission has been made (i.e. one which results in a "Notice of No Objection" or "Notice of No Objection Subject to").

4.3.6.6 If the Engineer issues a "Notice of Rejection", the Contractor shall resubmit the complete submission, clearly demonstrating how the Engineer's comments have been taken into account and resubmit amended or corrected material within 10 working days of issue of the Engineer's comments, using the process described in clause 4.3.5 above.

4.4 Records

4.4.1 The Contractor shall establish and maintain a place for the storage and archiving of all the documents relating to the Works and not required to be submitted to the Engineer under clause 4.1 above which shall be:

(1) the same place or office where the Contractor is performing the work and storing documents reviewed by the Engineer, or;

(2) at the Site or elsewhere in Jaipur, a records office, which contains all other, documents that the Contractor is required to maintain in accordance with the Contract.

4.4.2 All documents shall be filed, indexed and suitably stored to permit easy identification and necessary audits.

4.4.3 The Contractor shall maintain in Jaipur his archive of all documents in connection with and arising out of the Contract, until 28 days after the issue of the Final Certificate or until final settlement of all Disputes, whichever is later.

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CHAPTER 5

5. QUALITY MANAGEMENT

5.1 Introduction

5.1.1 The Contractor shall maintain and implement a Quality Management System that shall remain in effect during the execution of the Works. The Contractor's Quality Management System shall be based on the International Standard ISO 9001:1994 "Model for quality assurance in design, development, production, installation and servicing." The Contractor shall submit its Quality Management System documentation for the Engineer's review as specified in this Chapter.

The Quality Management System documentation shall include, but shall not be limited to the following:

(1) quality manual;

(2) quality procedures and work instructions;

(3) quality plans; and

(4) inspection and test plans.

5.1.2 The Contractor shall plan, perform and record all quality control activities to ensure that all work is performed in accordance with the requirements of the Contract and is detailed in the quality plans which are required under this Chapter. Such activities shall include, without limitation, the inspections and/or tests expressly or implicitly required by the Contract.

5.1.3 Without prejudice to such requirements, the Engineer may from time to time instruct the Contractor in relation to such further or other inspections and/or tests as are in his opinion appropriate.

5.1.4 Quality audits will be conducted by the Engineer to verify the Contractor's implementation and compliance with the quality management system as specified herein.

5.2 General Requirements

5.2.1 All quality system documents and plans to be submitted shall embrace all activities of the Contractor and sub-contractors of any tier, including its suppliers and any design consultants.

5.2.2 Quality Plans

5.2.2.1 The quality plans to be submitted by the Contractor shall comprise of:

(1) a Management Quality Plan, for the control of all management related activities;

(2) Manufacturing Quality Plan and Site Quality Plan, for the control of activities within each category of work or discrete element of

procurement, manufacturing, delivery, construction and installation of the Works, including Temporary Works.

5.2.3 Within 30 days of the Commencement Date of the Works, the Contractor shall submit for review by the Engineer:

(1) a quality manual;

(2) the quality system procedures and any associated system instructions and/or forms which he proposes to use for the Works; and

(3) the initial submission of quality plans shall be a development of that submitted at Tender stage and shall contain as a minimum, the Contractor's proposed Management Quality Plan as detailed further in this Chapter.

5.2.4 The Contractor shall submit separate Manufacturing Quality Plan and Site Quality Plan covering all elements of the Works. These shall be in accordance with the specific requirements of this Chapter and shall be submitted to the Engineer for review 30 days prior to the commencement of the manufacturing and construction works covered by the quality plans. In addition, the Contractor shall prepare inspection and test plans for the management and control of the inspection and/or testing by the Contractor of the Works identified in each quality plan.

5.2.5 The Contractor shall promptly supply the Engineer with two (2) controlled copies of his quality manual, quality plans, inspection and test plans and related procedures/instructions/forms upon such documents being reviewed without objection by the Engineer. The Contractor shall maintain such controlled documents throughout the duration of the Contract. For any amendment to quality system documentation, the Contractor shall as soon as reasonably practicable prepare and submit the proposed amendment for review by the Engineer. In addition, the Engineer may request further copies of the quality system documents and these documents shall reach the Engineer's office within fourteen (14) days of notification.

5.3 Management Quality Plan

5.3.1 The Management Quality Plan shall define the Contractor's management structure for the execution of the Works and for the control of the quality of the Works and shall submit this plan within 30 days of commencement date of work. The management quality plan shall without limitation, define:

(1) the organisation of the Contractor's managerial staff with particular reference to any joint venture partners and main sub-contractors. An organisation chart shall be produced to illustrate the sub-division of the Works into elements for effective technical and managerial control, the reporting structure and the interface relationship between all parties involved;

(2) the hierarchy of the overall quality management system documentation to be applied to the Works;

(3) the quality management system of the Contractor in monitoring and controlling sub-contractors and suppliers; and

(4) the list of quality system procedures and work instructions to be applied to manage the quality of the Works.

5.4 Manufacturing Quality Plan

5.4.1 The Contractor shall prepare a Manufacturing Quality Plan for his manufacturing works and submit this plan 30 days prior to the commencement of manufacturing works. The Manufacturing Quality Plan shall, without limitation, define:

(1) the organisation of the Contractor's staff directly responsible for the day-to-day management of the manufacturing activities on or off the Site;

(2) the specific allocations of responsibilities and authorities given to identified personnel or sub-contractors for particular manufacturing work;

(3) the hierarchy of quality management system documentation for managing and controlling manufacturing works, including manufacturing works of sub-contractors of any tier; and

(4) the list of procedures and instructions to be applied to manage and control the manufacturing works, together with the procedures and instructions which have not been previously submitted for review.

5.4.2 The Contractor shall also prepare inspection and test plans to manage and control any test and inspection activities.

5.5 Site Quality Plan

5.5.1 The Contractor shall prepare a Site Quality Plan for its construction and installation works. The Site Quality Plan shall, without limitation, define:

(1) the organisation of the Contractor's staff directly responsible for the day-to-day management of the construction and installation activities on or off the Site;

(2) the specific allocations of responsibilities and authorities given to identified personnel or sub-contractors for particular construction and installation work;

(3) the hierarchy of quality management system documentation for managing and controlling construction and installation works, including construction and installation works of sub-contractors of any tier; and

(4) the list of procedures and instructions to be applied to manage and control the construction and installation works together with the procedures and instructions that have not been previously submitted for review.

5.5.2 The Contractor shall also prepare inspection and test plans to manage and control any test and inspection activities in accordance with clause 5.6.1 below.

5.6 Inspection and Test Plans, Records and Reports

5.6.1 Inspection and test plans shall be produced for every activity requiring test and/or inspection. Each inspection and test plan shall identify the quality objectives and include, without limitation:

(1) the personnel responsible for undertaking and certifying the inspection and/or test;

(2) the procedure or instructions for the inspection and/or test;

(3) the test method or a reference to the relevant standard of testing;

(4) the inspection and/or test required prior to commencement of an activity;

(5) the inspection and/or test during an activity and its frequency;

(6) the inspection and/or test required to complete an activity;

(7) all Quality Control Points, Quality Hold Points and any notices or other documents to be given to the Engineer in relation to Quality Control Points and Quality Hold Points;

(8) the compliance criteria;

(9) the method of analysis of test data;

(10) the procedure for correction or disposal of any work which fails the compliance criteria;

(11) examples of the documentation to be used for reporting the results of inspections, tests and analysis of test data;

(12) examples of the documentation to be used for recording the status of inspections and tests in accordance with clause 5.8.1 below; and

(13) the procedure for the distribution, filing and storage of inspection reports, test reports and reports on analysis of test data.

5.6.2 Each report of the inspection and/or test shall be prepared in accordance with clause 8.3.6.1 below.

5.6.3 The Contractor shall ensure that a signed copy of each report of inspection and test is filed in his filing system within 3 (three) working days of the date of inspection and test.

5.6.4 In relation to all Quality Control Points and Quality Hold Points involving inspection and/or test by the Contractor, the Contractor shall give the Engineer notice of when the relevant work will be inspected and/or tested in accordance with clause8.5.1 below.

5.7 Review, Verification & Audit

5.7.1 The Contractor shall continuously monitor the performance of each quality plan related to the execution of the Works and shall include in each Monthly Progress Report the status of all quality system documentation, an up-to-date audit schedule and status and an up-to-date non-conformity register providing the status of all non-conformities identified by the Engineer and the Contractor. The Contractor shall make an appraisal of such performance and identify in particular any non-conformities or other shortcomings in the quality management system, the actions being taken to dispose of these non-conformities, any necessary corrective action taken or proposed to be taken to prevent the re-occurrence of these non-conformities or shortcomings and, any other items as instructed by the Engineer.

5.7.2 The Contractor shall ensure that audits of all the activities in each quality plan are carried out at quarterly intervals, or at such other intervals as the Engineer may require, to ensure the continuing suitability and effectiveness of the quality management system. Reports of each such audit shall be submitted promptly for review by the Engineer.

5.7.3 The Engineer may, by notice to the Contractor, require external audits of the Contractor's quality management system to be carried out either by the Employer's staff or by his representative. In such case, the Contractor shall afford to such auditors all necessary facilities and access to the records to permit this function to be performed.

5.8 Quality Control Register

5.8.1 The Contractor shall provide and maintain at all stages of the Works a quality control register or registers to identify the status of inspections, sampling and testing of the work and all certificates. Such registers shall be updated by the Contractor to show all activities in previous months and shall reach the Engineer's office before the 7th working day of each month. Each register shall:

(1) list the certificates received for each batch of goods and materials incorporated in the Works and compare this against the certification required by the Contract and the Contractor's quality plans;

(2) list the inspection and testing activities undertaken by the Contractor on each element of the Works and compare these activities against the amount of inspection and testing required by the Contract and the Contractor's quality plans;

(3) show the results of each report of inspection and/or test and any required analysis of these results and compare these results against the pass/fail criteria; and

(4) summarise any actions proposed by the Contractor to overcome any non-conformity identified in clauses 5.8.1.(1),(2) & (3) above.

5.9 Summaries of Inspection and/or Test

The Contractor shall submit to the Engineer for his information summaries based on quality control register in accordance with the Summaries of Inspection and/or Test described in clause 8.3.11 below.

5.10 Notification of Non-conformities

5.10.1 If, prior to the issue of the Taking Over Certificate for the Works or the relevant Section, the Contractor has used or proposes to use or repair any item of the Works which does not conform to the requirements of the Contract, he shall immediately submit to the Engineer such proposal, supplying full particulars of the non-conformity and, if appropriate, of the proposed means of repair which shall include any calculation analysis or other documentation to support the repair or acceptability of the non-conformity.

5.10.2 If the Engineer issues non-conformity reports or similar documents to notify the Contractor of any item of the Works which he considers to constitute a non-conformity and which has not been reported in accordance with clause 5.10.1 above, the Contractor shall promptly investigate the matter and, within 14 days of notification by the Engineer, submit to the Engineer for review the remedial measures to be taken and stating the reasons for such measures.

* End of Chapter *

CHAPTER 6

6. MATERIALS AND EQUIPMENT

6.1 Materials and Equipment Provided by the Employer

6.1.1 Materials and equipment which are to be provided by the Employer will be as stated in the Contract.

6.1.2 Materials and equipment provided by the Employer shall be collected by the Contractor from the locations as per contract conditions. The Contractor shall inspect the materials and equipment before taking receipt and shall immediately inform the Engineer of any shortage or damage.

6.1.3 Materials or equipment provided by the Employer which are damaged/lost after collection shall be replaced by the Contractor and offered to the Engineer for approval. In case, the contractor fails to replace the damaged material, the cost of material with additional costs as per agreement will be recovered from the Bank Guarantees furnished by the Contractor for safe custody of the materials supplied by the Employer.

6.1.4 The Contractor shall dispose of crates and containers for materials or equipment provided by the Employer.

6.1.5 Equipment / materials provided by the Employer, surplus to the requirements of the Works shall be returned at the earliest as directed by the Engineer.

6.1.6 The Contractor shall protect and maintain equipment provided by the Employer while it is on the Site and shall provide operatives, fuel and other consumables required to operate the equipment.

6.2 Materials

6.2.1 General

6.2.1.1 Materials for inclusion in the Permanent Works shall be new unless otherwise stated in the Contract or having been reviewed without objection by the Engineer.

6.2.1.2 Certificates of tests by manufacturers, which are submitted to the Engineer, shall relate to the material delivered to the Site. Certified true copies of certificates may be submitted if the original certificates cannot be obtained out the manufacturer. A letter from the supplier stating that the certificates relate to the material delivered to the Site shall be submitted with the certificates.

6.2.1.3 Materials, which are specified by means of trade or proprietary names, may be substituted by materials from a different manufacturer, provided that the materials are of the same or better quality and comply with the specified requirements and have been reviewed without objection by the Engineer.

6.2.1.4 In addition to any special provisions in the Contract for the sampling and testing of materials, the Contractor shall submit samples of all materials and goods which he proposes to use or employ in or for the Works. Such samples, if having been reviewed without objection, shall be retained by the Engineer and shall not be returned to the Contractor or used in the Permanent Works unless reviewed by the Engineer. No materials or goods of which samples have been submitted shall be used in the Works unless and until the Engineer shall have reviewed such samples without objection.

6.2.1.5 The Engineer may reject any materials and goods which in his opinion are inferior to the samples previously reviewed and the Contractor shall promptly remove such materials and goods from the Site.

6.2.1.6 If any material required for this Contract is not available in metric specifications from any known sources, at the time the material is required for the Contract, the Engineer may, upon application from the Contractor, give permission to the use of an equivalent material in imperial specifications as a substitute, provided that:

(1) no statutory specification shall be altered except in accordance with relevant legal provision, if any;

(2) the Engineer is satisfied that the Contractor has made every reasonable effort to obtain the material in metric specifications;

(3) in the opinion of the Engineer, the substitute material is suitable for the Works in all respects;

(4) in the opinion of the Engineer, the substitute material complies with all the specifications for the material substituted, allowing minor discrepancies between the specified metric measurements and the corresponding imperial measurements of the substitute, provided that such discrepancies can be effectively and satisfactorily compensated for by the provision of extra quantity of the material; and

(5) the Contractor shall be responsible for all extra quantities of the material required for meeting design and specification requirements of the Works due to the use of the substitute.

6.2.2 Notice of place of manufacture and/or source of supply

The Contractor shall notify the Engineer of the places of manufacture and/or the source of supply of all goods and materials previously reviewed without objection by the Engineer to be incorporated into the Permanent Works. The Contractor shall give reasonable notice (which shall not in any event be less than 56 days) to the Engineer before the start of any manufacturing and/or the supply of goods and materials.

6.2.3 Certificates for Manufactured Goods or Materials

The Contractor shall obtain certificates for each batch of goods and materials incorporated into the Permanent Works. Each certificate shall certify that the materials comply with the requirements of the Contract and shall include all reports of inspections and/or tests carried out at the place of manufacture.

6.3 Equipment

6.3.1 Identification labels

6.3.1.1 Each and every individual item of equipment forming part of the Permanent Works shall be fitted with permanent identification labels in accordance with a system based on the contract identification. In this respect, the term "individual item of equipment" refers to a complete assembly of components and to each removable sub-module within the complete assembly.

6.3.1.2 The proposed labelling system shall be submitted for review by the Engineer at least 1 months before the scheduled date for the shipment of the first item of equipment to site.

6.3.1.3 The identification label whenever possible shall be permanently attached in such a way that it shall not become detached or illegible during the lifetime of the system from any cause including wear and tear, environmental effects (such as rain, direct sunlight, etc.) or any other influence. Preference shall be given to embossed or engraved metallic labels mechanically fastened by riveting or similar means to the item to which they refer.

6.3.1.4 All labels shall be of the type that can be easily cleaned to remove dirt and debris (including grease and oil) without disturbing the legibility properties.

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CHAPTER 7

7. PACKAGING, STORAGE, SHIPPING AND DELIVERY

7.1 Storage

7.1.1 The Contractor shall provide and maintain acceptable storage facilities for the Permanent Works, equipment and materials of all kinds intended for use in carrying out the Works or for incorporation into the Works.

7.1.2 The Contractor shall prepare, protect and store in an agreed manner all Permanent Works, Contractor's Equipment, equipment and materials so as to safeguard them against loss or damage from repeated handling, from climatic influences and from all other hazards arising during shipment or storage on or off the Site.

(1) Secure and covered storage shall be provided by the Contractor for all Permanent Works, Contractor's Equipment, equipment and materials which are other than those having been reviewed without objection by the Engineer as suitable for open storage.

7.2 General Precautions

7.2.1 Appropriate precautions in accordance with the GCC, Contractor's safety regulations, the regulations of the Employer, and statutory regulations shall be taken in respect of all hazardous, toxic, inflammable, etc. materials.

7.3 Packaging Procedures

7.3.1 All required inspection/test certificates shall be supplied and packed together with individual material. All packaging materials and procedures shall be subject to review by the Engineer.

7.3.2 All empty cases, crates or packages, whether or not returnable, shall be removed from the Site by the Contractor or stored by the Contractor in such a way that they do not interfere with the progress of the works of Project Contractors.

7.3.3 Two copies of packing lists and quality certificates shall be attached to each case or package to be shipped. One copy shall be placed inside the package and the second copy shall be enclosed in a watertight enclosure on the outside of each case or package. A copy of packing lists and quality certificates shall be sent to the Engineer after each package of the Works, the equipment, spare parts and other items to be shipped have been shipped.

7.4 Shipping

7.4.1 Without prejudice to any other provisions of the Contract, the Contractor shall be responsible for all legal requirements, duties, dues, taxes and other such

requirements and expenditures required for the importation of the Works, the equipment, spare parts and other items to be supplied under the Contract into Jaipur.

7.4.2 The Contractor shall clear the Works, the equipment, spare parts and other items to be supplied under the Contract through Jaipur customs/Indian sea port in accordance with all Government of India Enactments.

7.5 Delivery

7.5.1 The Contractor shall deliver the Works and all items to be supplied under the Contract to the Site.

7.5.2 The Contractor shall unload the Works and all items to be supplied under the Contract at the designated delivery point and positioning or storing them.

7.5.3 Any part of the Works or any item to be supplied under the Contract that is damaged in transit shall not be considered as delivered until repairs or replacements have been made and all necessary spare parts or items have been delivered to the Site.

7.5.4 All documents, manuals, drawings and other deliverables shall be delivered to an address in Jaipur to be designated by the Engineer in writing.

7.5.5 The Contractor shall store and secure the Works, equipment, spare parts and other items until the same have been inspected and are considered delivered at the designated point by the Engineer.

7.5.6 An item shall be considered delivered when all damage have been repaired and all documentation and post delivery preparation have been completed to the satisfaction of the Engineer.

* End of Chapter *

CHAPTER 8

8. TESTING AND COMMISSIONING

Testing and Commissioning shall comply with all the requirements of the GCC supplemented, amplified, modified or superseded as applicable by this Specification and the PS.

8.1 General

8.1.1 The Contractor shall perform all testing and commissioning activities to satisfactorily demonstrate the performance of the Works within the framework of the Completion Management Plan.

8.1.2 The Contractor's activities shall include but are not limited to the following:

(1) provision of all labour and experienced supervision to perform all inspections and tests required to demonstrate the performance of the Works;

(2) preparation of that portion of the Commissioning Plan that applies to the Works to a level of detail acceptable to the Engineer;

(3) performance of all duties and responsibilities, as specified in the Commissioning Plan;

(4) participation in the Commissioning Team that shall develop, review and implement the Commissioning Plan. As a participant of the Commissioning Team, the Contractor shall provide personnel and technical support to the Employer and the Engineer in the Commissioning of the Project;

(5) performance of the testing and commissioning for all systems forming part of the Works in a manner which is fully co-ordinated with other designated Contractors, the Employer and the Engineer;

(6) provision of all required testing and specialised equipment and materials including consumables required to support the testing and commissioning pre-operations activities; and

(7) removal and appropriate disposal of any toxic or other spoils (e.g. cable drums, depleted filters, oils, and fluids) created as a result of the Contractor's construction, testing and commissioning activities.

8.1.3 The Contractor shall provide full access for the Employer and Engineer to witness any test or inspection.

8.1.4 The Employer and the Engineer will bear their own costs for attendance at witnessed inspections or tests (other than re-tests) scheduled in accordance with the agreed Works Programme and subject to notice in accordance with the Specification.

8.1.5 **Installation Tests**

8.1.5.1 The Installation Tests phase is defined as being the final stage of assembly/installation before the start of commissioning itself. The Installation Tests are to be performed by the Contractor under the Contract and may be witnessed by the Employer or the Engineer. During this phase, the Contractor shall perform static testing of components and/or systems in preparation for Partial Acceptance Testing.

8.1.5.2 The particular requirements for Installation Tests are prescribed in the PS. Where performance across interfaces to other Contractors or to other parties is required to be verified, the Contractor shall liaise with the interfacing party to co-ordinate the test procedures and programme in the manner prescribed in clause 3.3.2 above.

8.1.5.3 The Contractor shall prepare three copies of a test report immediately after the completion of each test whether or not witnessed by the Employer or the Engineer. If the Employer or the Engineer has witnessed the test, he will countersign the report to indicate his agreement to the information and conclusions (i.e. whether or not the equipment being tested has passed satisfactorily) contained therein. If the Employer or the Engineer has not witnessed the test (i.e. if a written waiver has been granted), the Contractor shall forward three copies of the test report without delay to the Engineer.

8.1.5.4 The Engineer will countersign the report to indicate his agreement to the information and conclusions (i.e. whether or not the equipment being tested has passed satisfactorily) and return one copy to the Contractor. Where the results of the test do not meet the requirements of the Specification, the Employer or the Engineer may call for a re-test.

8.1.5.5 Test equipment and instrumentation shall be subject to calibration test within a properly controlled calibration scheme, and signed calibration certificates shall be supplied to the Engineer in duplicate. Such calibration checks shall be undertaken prior to testing and, if required by the Employer or the Engineer, shall be repeated afterwards.

8.1.5.6 The Contractor shall submit to the Engineer a comprehensive schedule of tests as required by the PS giving full details and procedures for each test to be carried out under the Contract and including the pass / fail criteria (i.e. the standards or limits to be achieved).

8.1.6 Integration Testing & Commissioning

8.1.6.1 Integrated Testing & Commissioning are defined as the final tests to be undertaken before the commencement of Service Trial. The Integrated Testing & Commissioning are part of the Tests on Completion to be performed by the Contractor under the Contract in order to achieve Employer's Taking Over of the Works. The Integrated Testing & Commissioning shall demonstrate the full compatibility between all interfacing systems. On satisfactory completion of the Integrated Testing & Commissioning, the tested items will be considered available for Service Trial.

8.1.6.2 The particular requirements for Integrated Testing & Commissioning are prescribed in the PS.

8.1.6.3 The Contractor shall submit to the Engineer a comprehensive Integrated Testing & Commissioning Plan as required by the PS. The plan shall be submitted on a logical section-by-section basis, using a "top-down" approach

describing the testing and commissioning strategies and processes clearly showing how these serve to provide the full verification of the systems and equipment in context of the complete railway system.

8.1.6.4 The Contractor shall co-ordinate with the Employer and the Engineer and with all interfacing parties to ensure that the proposed test programme and schedule truly demonstrate that the full specified performance requirements are achieved.

8.1.6.5 The tests shall include, but shall not be limited to the following:-

(1) test of all functional and performance requirements for the system;

(2) test to demonstrate compliance with all interface specifications; and

(3) test of behaviour under failure conditions (e.g. changeover to redundant hardware, initiation of re-configuration functions or reversionary modes of operation, recovery of systems and equipment from failure, demonstrations of planned emergency procedures, etc.).

8.1.6.6 The Integrated Testing & Commissioning Plan shall identify a comprehensive list of specifications, standards, method statements, procedures, pass/fail criteria, sample records, resources to be made available, drawings and records to be submitted to the Engineer, and a programme showing the dates for testing and for submission of each test procedure.

8.1.6.7 Test procedures shall be carefully planned to ensure that the work can be executed in the time available. If the available time is restricted, this planning shall include contingency plans to be implemented if testing proceeds slower than anticipated or if defects are discovered that necessitate rectification and subsequent repeat testing, etc.

8.1.6.8 Immediately following the successful Integrated Testing & Commissioning of the system or any constituent part, the Contractor shall complete the appropriate commissioning records in the agreed format and submit 3 signed copies to the Engineer.

8.1.6.9 The Contractor shall include a complete schedule of all Integrated Testing & Commissioning records and their current status within the Monthly Progress Report.

8.1.7 **Service Trial**

8.1.7.1 Service Trial is defined as the final test of the fixed equipment, the rolling stock, and the operational procedures including the final elements of the Tests on Completion to demonstrate that the system in its entirety can operate satisfactorily. The Service Trial is performed by the Employer with attendance by the Contractor under the Contract in order to achieve Employer's Taking Over of the Works. During this phase, the system will be run to the published timetable but without fare-paying passengers. This phase also allows for Validation of the training procedures in a real time environment.

8.1.7.2 The Commissioning Team in conjunction with the Employer will develop the Service Trial Plan. Operations Department and will serve to organise and co-ordinate all on-Site activities.

8.1.7.3 The particular requirements for tests to be undertaken during the Service Trial are prescribed in the PS.

8.1.7.4 The Contractor shall provide special and general attendance to the Employer and the Engineer during the Service Trial period as required by the PS.

8.1.7.5 The Contractor shall co-operate with the Employer and the Engineer and with all interfacing parties to ensure that the proposed Service Trial programme and schedule truly demonstrates that the full, specified performance requirements and operating parameters are achieved.

8.1.7.6 The Contractor shall review and comment on the Engineer's Service Trial Plan and shall identify specifications, standards, method statements, procedures, pass / fail criteria, to the Engineer for inclusion in the Plan.

8.1.7.7 The Contractor shall not interfere with the Service Trial tests and Validations in any manner. Any need for remedial works required to be performed by the Contractor shall be co-ordinated with the Employer and the Engineer in advance.

8.1.7.8 Immediately following the successful tests of the system or any constituent part during Service Trial the Contractor shall complete the appropriate commissioning records in the agreed format, submit 3 signed copies to the Engineer and may then apply for the Taking Over Certificate in accordance with the requirements of the GCC.

8.1.7.9 The Contractor shall include a complete schedule of all Service Trial records and their current status within the Monthly Progress Report.

8.2 Activity of the Employer and the Engineer

8.2.1 The Employer and the Engineer will establish a Commissioning Team and a Site Co-ordination Team at appropriate stages of the Project. These teams will comprise representatives of all interested parties including not more than two representatives of the Contractor, subject to review by the Employer and the Engineer. In accordance with the Commissioning Plan, the Commissioning Team shall advise and plan to co-ordinate the activities of the Contractor to ensure the Employer and the Employer's requirements are met.

8.2.2 The Contractor shall participate in the activities of the Commissioning Team and Site Co-ordination Team in addition to its own testing and commissioning or as directed by the Employer or the Engineer.

8.3 Records and Reports

8.3.1 The Contractor shall submit to the Engineer for review not less than six (6) months before commissioning activities commence his proposed format for the commissioning records. The records shall be appropriately sub-divided to make provision for the various parts of the Permanent Works covered by the Contract.

8.3.2 The format of the records shall cover all mechanical and electrical tests, provide positive identification by serial number for assemblies and sub-assemblies of the Permanent Works and show modifications to Employer's

Drawings and diagrams or "as built" data to be certified by the Employer or the Engineer in the course of installation, testing and setting to work of the Works.

8.3.3 The Contractor shall, during the execution of the Works, prepare such reports and records of manufacture, installation and testing as may be required in order that a licence may be issued or statutory requirements may be met or approval given. Such reports or records shall be adequate to enable each part of the Permanent Works to be commissioned and to meet the requirements of the licensing authority or any standing statutory regulations, and shall be reviewed by the Employer and the Engineer.

8.3.4 The Contractor shall obtain reports of each inspection and/or test. Such reports shall show the results of all the inspections and/or tests carried out and shall certify that the work has been inspected and/or tested in accordance with the requirements of the Contract and that the work complies with the requirements of the Contract.

8.3.5 Any analysis of the results required to confirm that the work complies with the requirements of the Contract shall be compiled and reported to the Engineer in accordance with Chapter 4.

8.3.6 A representative of the Contractor who has been allocated the required authority under the relevant quality plans shall sign each report of inspection and/or test.

8.3.6.1 Each report of inspection and/or test shall include the appropriate details of:-

(1) the description of the item or goods subjected to the test or inspection;

(2) if applicable, the batch from which the samples were taken for test, the size and description of samples and the method of sampling;

(3) the place of testing;

(4) the date and time of tests;

(5) the environmental conditions;

(6) the technical personnel supervising or carrying out the test or inspection;

(7) the properties tested or inspected;

(8) the method of testing or inspection;

(9) all relevant checklists and work sheets used during the inspection and/or test, including the readings and measurements taken during the tests; and

(10) the test results, including any calculations and graphs.

8.3.7 After Commissioning of a part of the Works, the Contractor shall complete each commissioning record in the agreed format and shall forward copies of the record to the Engineer for review.

8.3.8 The Contractor shall submit within its Monthly Progress Report a complete schedule of his commissioning records showing completion dates, target completion dates and status.

8.3.9 Timing for Reports of Inspection and/or Test

The Contractor shall ensure that a signed copy of each report of inspection and test is filed in his filing system within 3 (three) working days of the date of inspection and test.

8.3.10 Quality Control Register

The Contractor shall provide and maintain at all stages of the work a quality control register or registers to identify the status of inspections, sampling and testing of the work and all certificates in accordance with Quality Control Register in Chapter 5.

8.3.11 Summaries of Inspection and/or Test

The Contractor shall submit to the Engineer for his information summaries based on each quality control register showing the type and amount of certification received and the inspection and/or testing undertaken on each element of the Works. Such summaries shall reach the Engineer's office before the 7th working day of the month. The summaries shall identify and demonstrate the compliance of such certification, inspection and/or testing with the requirements of the Contract and shall identify any item which does not conform to the requirements of the Contract.

8.4 Test Equipment and Facilities

8.4.1 The Contractor shall provide all equipment and services required for testing, including, but not limited to:

i. Laboratory test instruments.

ii. Special test equipment, emulators, simulators and test software, to permit full testing of System functions and performance.

iii. Other items of the System, specified elsewhere as being part of the Contractor's supply, even if not part of the Subsystem under test.

iv. Consumables.

8.4.2 All test instruments shall be subject to routine inspection, testing and calibration by the Contractor.

8.4.3 Details of all test instruments shall be submitted for review by the Engineer and, if required by the Employer or the Engineer, shall be calibrated at the expense of the Contractor by an independent standards laboratory.

8.4.4 All test equipment must be capable of operating from the mains supply (230V AC 50Hz).

8.4.5 All test software shall be subject to formal quality assurance requirements stipulated elsewhere in the Specification.

8.4.6 The Contractor shall ensure that all inspection and test equipment is calibrated in accordance with the specified standards or, if such standards are not applicable to certain test and inspection equipment, with systems and programmes of calibration which have been reviewed without objection by the Engineer.

8.4.7 The Contractor shall ensure that documented evidence of instrument calibration is maintained and made available to the Employer or the Engineer on request.

8.5 Witnessing by the Employer and the Engineer

8.5.1 Notice for Trial, Inspection and/or Test to the Engineer

8.5.1.1 In relation to all Quality Control Points and Quality Hold Points involving inspection and/or testing by the Contractor, the Contractor shall give the Engineer notice of when the relevant work will be inspected and/or tested using the form in appendix 5 of this Specification. The period of notice shall be as stated in the PS or such period as in the opinion of the Engineer is reasonable and notified to the Contractor. In the absence of any such statement or notice, a reasonable period of notice shall be given by the Contractor provided that:

(1) in the case of on-Site work, such notice shall be given not less than 72 hours of normal working time before the work is to be inspected and/or tested;

(2) in the case of work carried out off-Site in Jaipur, such notice shall be given not less than 5 days before the work is to be inspected and/or tested; and

(3) in the case of work carried out outside Jaipur, such notice shall be given not less than 14 working days before the work is to be inspected and/or tested.

8.5.1.2 In relation to all inspection and/or testing notified by the Contractor, the Employer and the Engineer may elect to witness such inspections and/or tests but the Contractor may proceed with the inspections and/or tests notwithstanding the absence of the Employer or the Engineer or of any response to the said notice.

8.5.1.3 If the Contractor is in any doubt whether inspection and/or testing by the Engineer is required as a Quality Hold Point, the Contractor shall request that the Engineer clarifies his requirements prior to submitting the relevant inspection and testing plan for review, and in any event not later than 30 days.

8.5.2 Timing for Inspection and/or Test by the Employer and the Engineer

8.5.2.1 The Contractor shall allow the Employer and the Engineer a reasonable time to carry out any inspection and/or testing and to assess the result of any inspection and/or test before proceeding with the Works.

8.5.2.2 Unless the Engineer's prior review without objection has been obtained, all inspections and/or tests to be carried out or witnessed by the Employer and the Engineer shall be carried out between 0800 and 1800 hours.

8.5.3 Failure to Notify the Engineer

The Employer or the Engineer may reject the test and test results in question, and require the test to be repeated in the event of any failure by the Contractor to notify the Engineer in accordance with clause 8.5.1.1 above.

8.6 Failures

8.6.1 The Contractor shall correct all faults found during testing, and shall arrange for the relevant tests to be repeated. The relevant tests shall only be repeated when the fault has been remedied and the equipment demonstrated to function correctly.

8.6.2 Where remedial measures involve significant modifications that might, in the Engineer's opinion, affect the validity of earlier tests, the Contractor shall repeat the earlier tests and obtain results satisfactory to the Employer and the Engineer before repeating the test in which the fault was first identified.

8.6.3 The Employer or the Engineer shall have the right to order the repeat or abandonment of any test in the event that results demonstrate that the equipment is significantly non-compliant with the Contract.

8.6.4 The Employer or the Engineer shall have the right to suspend any test in the event that errors or failures have become unacceptable. The Employer or the Engineer shall also have the right to suspend any test if a fault was detected by the Contractor but not reported to the Engineer within 24 hours of the detection. In this event, the suspension shall remain in effect until reporting has been brought up to date to the satisfaction of the Employer and the Engineer.

8.7 Repeat Tests

8.7.1 The Contractor shall correct and re-test every fault detected during the tests.

8.7.2 If the test results of the item under test fails, the provisions of GCC clause 7.5 shall apply.

* End of Chapter *

CHAPTER 9

9. TRAINING - DELETED

END OF CHAPTER

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CHAPTER 10

10. THE WORKS AND CARE OF THE WORKS

10.1. Methods of Construction

10.1.1. The Contractor shall, submit the Construction and Installation Plan as stated in the PS or if none is given within 20 days of the commencement date of works and in any case not less than 5 weeks before starting the construction of the Works on Site, submit to the Engineer the Construction and Installation Plan as specified in Chapter 3 above.

10.2. Temporary Works

Upon receiving a written application from the Contractor, the Engineer may at his absolute discretion consent to certain Temporary Works of a minor nature being exempted from the requirements of this Chapter. Such exemption shall not relieve the Contractor of any of his obligations under the Contract.

10.3. Normal Working Hours

10.3.1. Normal working hours shall be defined as the period between 0700 hours and 1900 hours on all days excluding General Holidays. Work outside normal working hours shall not be carried out unless reviewed without objection by the Engineer and unless the Contractor has obtained any necessary permission or approval from Relevant Authorities.

10.3.2. The Contractor shall inform the Engineer 24 hours, or such shorter period reviewed without objection by the Engineer, in advance of any occasion when work outside normal working hours is proposed.

10.4. Drawings and Schedules

Detailed manufacturing drawings for the Permanent Works shall be submitted to the Engineer for review. Moreover, these drawings shall be available on the Contractor's or his sub-contractor's premises if required. The Contractor shall also maintain at the Site a comprehensive and up-to-date set of drawings properly indexed and catalogued, which shall include complete sets of detailed working and, where applicable, manufacturing drawings and shall permit free access to such drawings by the Engineer at any reasonable time.

10.5. Notification and Inspection of Works

10.5.1. The Works will be the subject of a formalised system of written applications for inspection.

10.5.2. Work that is carried out without being appropriately sanctioned by the Engineer could be classified as defective work.

10.6. Construction Restraints

10.6.1. The Contractor shall design and implement Temporary Traffic Management (TTM) in accordance with the provisions of the Enactments.

10.6.2. The Contractor shall ensure that the design, construction and performance of all Temporary Works and the design and construction of all Permanent Works shall be such that any ground movements in and around the Site will not result in settlement and/or subsidence of the ground that will cause damage to any buildings, structures, rail, roads, footpaths, slopes or utilities.

10.7. Protection from Water

10.7.1. Unless otherwise reviewed by the Engineer, all work shall be carried out, as near as may be practicable in the circumstances, in dry conditions, except where the work is required to be carried out in or with water or other fluids.

10.7.2. The Permanent Works, including materials for use in the Permanent Works, shall, where necessary and as near as may be practicable, be kept free of water and protected from damage due to water. Water on the Site and water entering the Site shall be disposed of by temporary drainage or pumping systems or by other methods capable of keeping the Works free of water and protected from damage due to water. Traps shall be provided by the Contractor to intercept silt and debris before water is discharged from the Site.

10.7.3. The discharge points of the temporary drainage and pumping systems shall be as those having been reviewed without objection by the Engineer. The Contractor shall make all arrangements with and obtain the necessary approvals and inspections from the Relevant Authorities for discharging water to drains, watercourses etc. The relevant work shall not start until the arrangements for disposal of the water previously reviewed without objection by the Engineer have been implemented.

10.7.4. Measures shall be taken to prevent flotation of new and existing structures.

10.8. Protection from Weather

10.8.1. Work shall not be carried out in weather conditions that may adversely affect the work unless protection by methods reviewed without objection by the Engineer is provided.

10.8.2. The Permanent Works, including materials for the Permanent Works, shall be protected by methods reviewed without objection by the Engineer from exposure to weather conditions which may adversely affect the Permanent Works.

10.9. Protection of Work

Finished work shall be protected by methods reviewed without objection by the Engineer from damage that could arise from the execution of adjacent work. Work shall be carried out in such a manner that work carried out by others, including Government departments, utility undertakings, Relevant Authorities and Project designated Contractors, is not damaged.

* End of Chapter *

CHAPTER 11

11. SITE ESTABLISHMENT AND ATTENDANCE

11.1 Use of the Site

11.1.1 The Site shall not be used by the Contractor for any purpose other than for executing the Works or carrying out other work which is associated with the Works and having been reviewed without objection by the Engineer.

11.1.2 Entry to and exit from the Site shall be obtained only at the locations stated in the Contract or other locations having been reviewed without objection by the Engineer.

11.1.3 All materials and equipment stored on Site shall be adequately protected against loss or damage due to any cause such as climatic effects, vandalism, shock and vibration, etc. according to the nature of the articles stored and the local Site condition.

11.1.4 The particular use to which the Site is put shall be submitted to the Engineer for review with the following particulars:

(1) drawings showing the layout within the Site of the Engineer's and Contractor's accommodation, access roads and major facilities required early in the Contract;

(2) drawings showing the layout and the construction details of the Engineer's accommodation; and

(3) proposals for the Contractor's Site accommodation (if applicable) as defined by clause 11.4 below.

11.2 Survey of the Site

On or before the Contractor is granted access to a certain portion of the Site, the Contractor shall carry out a survey jointly with the Other Contractors executing works on that portion of the Site. The Contractor shall advise the Engineer of the date of the joint survey at least 1 week in advance of the date.

11.3 Fences and Signs on the Site

11.3.1 Hoardings, fences, gates and signs on and at the Site shall be maintained in a clean, stable and secure condition.

11.3.2 Project signboards stated in the Contract shall be erected not more than 28 days, or such other period reviewed without objection by the Engineer, after the Commencement Date of the Works. Other advertising signs shall not be erected on the Site unless reviewed by the Engineer.

11.3.3 The permission of the Engineer shall be obtained before hoardings, fences, gates or signs are removed. Hoardings, fences, gates and signs which are to

be left in position after Employer's Taking Over of the Works shall be repaired and repainted as instructed by the Engineer.

11.4 The Contractor's Site Accommodation

11.4.1 The Contractor's offices, sheds, stores, mess rooms, latrines and other accommodation on the Site shall be maintained in a clean, stable and secure condition. Living accommodation shall not be provided on the Site unless stated in the Contract or having been reviewed without objection by the Engineer. The Contractor's personnel shall not be allowed to live on the Site.

11.4.2 The Contractor shall provide and maintain all necessary offices, sheds, stores, mess rooms, latrines and other accommodation and remove the same from the Site on the Employer's Taking Over of the Works. These shall be to the satisfaction of the Engineer and shall be kept in a clean and sanitary condition. No structure shall be erected by the Contractor within the Site without the written consent of the Engineer and such consent will not relieve the Contractor of the responsibility of siting temporary structures clear of the Works.

11.4.3 A copy of the plan showing the extent and position of all offices, stores, sheds, etc. shall be prepared by the Contractor and retained for inspection in the Site office.

11.4.4 The works area for Contractor's accommodation will be available to the Contractor on dates set out in the PS, Employer's Drawings or Appendix of this Specification.

11.4.5 The Contractor shall not erect or operate canteen and kitchen facilities on the Site except with the consent of the Engineer and, where appropriate, the Relevant Authorities. Any such facilities shall, in particular but without limitation, conform to all regulations and standards to the extent required by the concerned city authorities of GNCTD..

11.5 Site Utilities and Access

11.5.1 Temporary water, electricity, telephone, sewerage and drainage facilities shall be provided for the Engineer's accommodation and for the Contractor's use in carrying out the Works. The Contractor shall make all arrangements with and obtain the necessary approvals from the Relevant Authorities for the facilities.

11.5.2 If, under the Contract, the Contractor is provided with Site utilities and access by any Other designated Contractor under the attendance of the same or another Other Contractor, the Contractor shall ensure that all requirements in terms of use of such facilities, their upkeep and maintenance, etc. are properly observed. If the facilities provided under such attendance are insufficient for the Contractor's bona fide needs, the Contractor shall be solely responsible for providing such additional facilities he may require for the execution of the Works.

11.5.3 Access roads and parking areas shall be provided within the Site as required and shall be maintained in a clean, passable and stable condition.

11.6 Site Facilities for the Engineer

11.6.1 Details of office accommodation, office facilities, equipment transport etc required are given in the PS.

11.6.2 Accommodation & Equipment

11.6.2.1 If required under the Contract, the accommodation to be provided on the Site for the Engineer/Employer shall be in accordance with the Contract.

11.6.2.2 The accommodation shall be maintained in a clean, stable and secure condition and shall be cleaned at least daily. The services of a full-time attendant shall be provided for the Engineer/Employer.

11.6.2.3 Office facilities and equipment provided for the use of the Engineer shall be maintained in a clean and serviceable condition including refreshments, stationeries, printer & cartridges, etc, all consumables shall be replenished when required. Measuring and testing equipment shall be calibrated before it is used and at regular intervals reviewed by the Engineer. Survey equipment shall be maintained by the service agent and shall be regularly checked. Equivalent replacements shall be provided for equipment that is out of service.

11.6.2.4 The permission of the Engineer shall be obtained before accommodation or equipment is removed. Portable accommodation shall be moved at the times instructed by the Engineer.

11.6.2.5 The accommodation to be provided for the Engineer is for the exclusive use of the Engineer's staff associated with the Project.

11.6.2.6 All accommodation and equipment for the Engineer shall be provided throughout the course of the Works and for so long a period of time during the Defects Liability Period as the Engineer may require.

11.6.2.7 The Contractor's proposals for the construction of the offices shall be submitted for review by the Engineer within 14 days of the Commencement Date of the Works and erected within 42 days of the Commencement Date of the Works.

11.6.2.8 The Contractor's attention is drawn to the fact that if directed by the Engineer, resident site staff for the Project shall be allowed use of the Engineer's Site accommodation including the extension of servicing to these resident site staff.

11.6.3 Transport

11.6.3.1 The Contractor shall provide transport for the Employer and Engineer from the Commencement Date of the Works.

11.6.3.2 The transport shall be for the exclusive use of the Employer and the Engineer and persons authorised by the Employer or the Engineer and shall be available at all times during normal working hours and at other times when the Contractor is working or when instructed by the Employer or the Engineer. The transport shall not be used by the Contractor or other persons.

11.6.3.3 The transport shall be maintained in a clean and serviceable condition and shall be serviced regularly. The Contractor shall provide toll charges, parking fees, taxes, licenses, insurance, fuel, oil and other consumables. All transport shall be covered by fully comprehensive insurance, which includes passenger liability and which allows the vehicle to be driven by any driver.

11.6.3.4 A competent English/Hindi-speaking driver shall be appointed and shall be available to drive the land transport when required by the Employer or the Engineer.

11.6.3.5 Records of journeys shall be kept in logbooks provided by the Engineer.

11.6.3.6 Equivalent alternative transport shall be provided when the designated transport is unavailable.

11.6.3.7 The transport shall be provided until the end of the Defects Liability Period or such earlier date as instructed by the Engineer.

11.7 Clearance of the Site

Temporary Works, which are not to remain on the Site after the Employer's Taking Over of the Works, shall be removed on the Employer's Taking Over of the Works or at such other time(s) as instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the same condition as existed before the Works started except as otherwise stated in the Contract.

11.8 Attendance

11.8.1 Offices for the Employer or the Engineer

Unless otherwise stated in the Contract, the Employer or the Engineer may supply his own temporary accommodation on the Site at locations indicated in the Contract or in writing. The Contractor shall afford, provide and maintain free and unhindered access to such Employer or the Engineer's Site offices and parking areas and for the Employer or the Engineer's Site officers, contractors and workmen as may be necessary for installation, inspection, maintenance, repair and removal of the aforesaid Employer or the Engineer's Site offices and the services thereto.

11.8.2 Assistance to the Employer or the Engineer

The Contractor shall provide all necessary assistance to the Employer or the Engineer, including adequate and safe means of access to all parts of the Site to assist him in carrying out his duties and responsibilities under the Contract. Such assistance shall not include the provision of full-time attendance upon the Employer or the Engineer.

11.8.3 Attendance on the Commissioner of Rail Safety or other inspecting authorities.

11.8.3.1 The Contractor shall afford all necessary attendance upon the Commissioner of Rail Safety or other inspecting authorities Inspectorate during their inspections including adequate and safe means of access to appropriate parts of the Site.

11.8.3.2 The Contractor shall provide all documents necessary for inspection as are requested by the above authorities.

11.8.4 Attendance on Other Contractors

11.8.4.1 The Contractor shall provide general and special attendance on Other designated Contractors who will be carrying out the execution of electrical and mechanical and other works on the Site. Reference shall be made to the PS to determine the full extent of such attendance.

11.8.4.2 General attendance shall include but not be limited to providing for accepting deliveries, unloading and storing materials for the Other Contractors on the Site and allowing the Other Contractors space for their site offices, and all reasonable access and facilities for the proper execution of their work including the free use of access roads, craneage, scaffolding, ladders, stores, mess rooms, sanitary and welfare facilities provided that these facilities are normally available on the Site at the time.

11.8.4.3 The Contractor shall allow the use of his Site services including ventilation, temporary water supply, temporary electricity supply, background lighting, pumping, watchmen, etc. by the Other Contractors. The Contractor shall ensure that his Site services referred to above shall be available for use by the Other Contractors until the commissioning of the relevant permanent installations or until the issue of the Taking Over Certificate for the Works, whichever is the later.

11.8.4.4 Special attendance shall include but not be limited to cutting of holes and other openings, forming chases, providing built-in sleeves, grouting in bolts, anchors, brackets, base plates, frames and the like, including making good to the disturbed work and cleaning after completion of the disturbed work.

11.8.5 Attendance by Other Contractors

11.8.5.1 Where provided for under the Contract, the Contractor shall receive attendance from Other Contractors. The Contractor shall ensure that by receiving such attendance, it does not hinder, obstruct or otherwise frustrate the Other Contractor that is providing the attendance in any way.

11.9 Contractor's Equipment

The Engineer reserves the right to order the immediate removal and replacement of any Contractor's Equipment that, in his opinion, is unsatisfactory for its purpose.

11.10 Security

11.10.1 The Contractor shall be responsible for the security of the works area for Contractor's accommodation and shall provide and maintain fencing to all works areas with designated entry /exit parts. The fencing shall be metal panels min. 2m heights and painted as directed by the engineer. Each entry /exit point shall be guarded by security staff on a 24 hrs. basis and fixed with a lockable gate.The Contractor shall provide adequate training to its security staff to ensure that they are able to discharge their security duties properly.

11.10.2 The Contractor shall establish and maintain contingency plans to cope with emergency situations such as fire, flooding, serious damage to the Works, etc.

11.10.3 The Employer's security staff will conduct inspections and security audits on the Site and the works area for Contractor's accommodation from time to time. The Engineer will give recommendations for improvement arising from the inspections and security audits to the Contractor. However, managing the security of the Site and the works area for Contractor's accommodation remain the Contractor's responsibility.

* End of Chapter *

CHAPTER 12

12. LIAISON WITH OTHERS

12.1 Liaison with Others

12.1.1 The Contractor shall make all necessary arrangements with and obtain the necessary approvals from Government departments, utility undertakings and other duly constituted authorities for the execution of the Works.

12.1.2 The Contractor shall maintain close liaison with Other Contractors and other contractors employed by the Employer, utility undertakings or other authorities who are carrying out work on or adjacent to the Site. The Contractor shall ensure as far as possible that the progress of the Works is not adversely affected by the activities of such other entities.

12.2 Work by Other Contractors

12.2.1 The contractor shall keep note of the works which may be proceeding on various adjacent areas by others include, but is not limited to, those listed in the PS. The Engineer will keep the Contractor informed of forthcoming work by Other Contractors in the proximity of the Site.

12.2.2 The Contractor shall provide reasonable access to such contractors and any other adjacent contractors and shall where necessary liase with the appropriate contractors, utility undertakings and other duly constituted authorities on details of interdependent phasing. The Contractor shall notify the Engineer and other concerned entities at least 14 days in advance should he wish to alter these access arrangements during the course of the Works.

12.3 Interface Management

12.3.1 The Contractor shall co-ordinate with Relevant Authorities and Other Contractors in the execution of the Works.

12.3.2 The Contractor shall interface and liase with Other Contractors to ensure the effective and compatible co-ordination of all aspects of the design, installation and testing of the Works. The Engineer shall be kept fully informed at all stages of the Works.

12.3.3 The Contractor shall assign a person as the interface contact for each Other Contractor to actively manage the progress of each interface to ensure adherence to the jointly developed Interface Management Plan.

12.3.4 The Engineer may, at his discretion, attend the Contractor's meetings with Other interfacing Contractors. The Contractor shall give the Engineer a minimum of 7 days notice of all meetings to be held with any Other interfacing Contractors, or 14 days notice if the meeting is to be outside Jaipur. If insufficient notice is given to the Engineer, he may require the meeting to be postponed to a later date to enable him to attend.

12.3.5 The Contractor shall provide the Engineer with two copies of the minutes of all meetings within 14 days of each meeting and also two copies of all correspondence with any Other Contractor.

12.3.6 The Contractor shall attend co-ordination meetings chaired by the Engineer at no greater than monthly intervals to discuss and ensure that designs are correct and that conflicts in E&M services requirements between the Contractor and Other Contractors are identified and resolved.

12.3.7 The Contractor shall co-ordinate his installation activities with the Other Contractors. The Contractor shall ensure that there is no interference to the work of the Other Contractors and shall maintain close co-ordination with Other Contractors working on or adjacent to the Works to ensure that their work can progress in a smooth and orderly manner.

12.3.8 The Contractor shall be given access to the various parts of the Site by the dates relative to the Works Programme defined in the ITT and the PS as Access Dates. The ITT and the PS specify certain Key Dates by which the Contractor shall complete certain parts of his Works to enable work to be undertaken by the Other Contractors. These dates may be subject to adjustment by the Engineer in consultation with the Contractor and the Other Contractors to ensure the progress of the Project.

12.3.9 The Contractor's responsibility shall include provision of and receipt from Other Contractors or the Engineer of information required for construction of the Works and the installation of the Works and Contractor's Equipment, insofar as that requirement is specified in or can reasonably be inferred from the Contract. Where the execution of work by a Other Contractor depends upon the Contractor's Site management or upon information to be given by the Contractor, the Contractor shall provide the Other Contractor with either the required services or the correct and accurate information required to enable the Other Contractor to meet his programme for the construction or installation of his works.

12.3.10 In the event of any disagreement as to the extent of services or information required to be exchanged between the Contractor and a Other Contractor, the Engineer shall determine the requirements and this determination shall be final and binding on the Contractor and the Other Contractor.

12.3.11 The Contractor shall co-ordinate his testing and commissioning activities with the Other Contractors. The Contractor shall ensure that there is no interference to the work of the Other Contractors and shall maintain close co-ordination with Other Contractors working on or adjacent to the Works to ensure that their testing and commissioning work can progress in a smooth and orderly manner.

∗ End of Chapter ∗

CHAPTER 13

13. THE SITE

13.1 Access to Site

The Contractor will be given access to the Site in accordance with following conditions.

13.2 Site Restrictions

13.2.1 The particular use to which the Site is put shall be submitted to the Engineer for review within 14 days of the Commencement Date of the Works and the Contractor shall:

(1) confine his use of the areas of the Site to purposes having been reviewed without objection by the Engineer who reserves the right to extend, amend or restrict the uses to which areas of the Site will be put;

(2) where required under the Contract, provide and maintain fencing and lighting around and within the areas of the Site when or where necessary for the safety and convenience of the public or others or as directed;

(3) refrain from depositing rubbish or causing nuisance or permitting nuisance to be caused and, except where reviewed without objection by the Engineer, depositing earth on or removing earth from areas of the Site;

(4) on the Employer's Taking Over of the Works, or earlier if so instructed by the Engineer, remove all Temporary Works except where permitted and reinstate the areas of the Site to the extent, standards and details indicated in the Contract or as directed by the Engineer;

(5) refrain from obstructing manholes, utility access points and the like; and

(6) refrain from felling trees, other than those specifically identified in the Contract to be felled, and refrain from depositing earth around the trunks of trees and protect all trees remaining on Site to the satisfaction of the Engineer.

13.2.2 Work other than that necessary for completion of the Works shall not be carried out on the Site.

13.2.3 While the Contractor is being given access to the Site, he shall provide means of distributing loads imposed by Contractor's Equipment and prevent damage to utility services.

13.2.4 Except where otherwise provided, the Contractor shall not permit any person to reside on the Site.

13.2.5 Unless otherwise stated, the Contractor shall pay all rates and charges of any nature whatsoever arising out of his use of the Site and all work areas provided therein under the Contract.

13.2.6 The location and size of stockpile material, including excavated material within the Site, shall be submitted to the Engineer for review. All stockpiles shall be maintained at all times in a stable condition.

13.2.7 The Contractor shall not allow animals to be brought onto or kept on the Site.

13.2.8 The Contractor's attention is drawn to the Waste Disposal Regulation currently prevalent in Jaipur, regarding storage, transportation and disposal of chemical waste. The Contractor's proposed methods and chemicals to be used in cleaning shall be submitted for review by the Engineer.

13.2.9 No rock crushing or screening facilities shall be set up on Site unless reviewed by the Relevant Authorities and reviewed without objection by the Engineer.

13.3 Site Services

13.3.1 Where required under the Contract, the Contractor shall provide all Site services as necessary and appropriate for the construction of the Works, which shall include, but not necessarily be limited to:

(1) electricity; (see Chapter 18 below)

(2) water;

(3) Site communication facilities; and

(4) temporary drainage and sewage disposal.

13.3.2 The Contractor shall provide such services for use solely in connection with the proper execution of the Works. The Contractor shall comply with all regulations of the utility companies and Government departments concerned. The Contractor shall provide and maintain installations associated with such services and in relation thereto and shall take all reasonable precautions to safeguard the safety and health of all persons and the security of the Site. The Engineer may demand the immediate disconnection or alteration of such installations or portions thereof he considers as being prejudicial to safety, health or security. As soon as any or all of the Contractor's installations are no longer required for the execution of the Works, they shall be entirely removed to the satisfaction of the Engineer.

13.3.3 All installations shall comply fully with all appropriate statutory requirements. Pipes, tubes, ducts or cables crossing highways, footpaths or rights of way shall be ramped over or recessed below the surface. Specific services shall comply with the following:-

(1) Electricity

The electricity supply shall comply with the requirements of Chapter 18 below.

(2) Water

An adequate supply of potable water shall be provided at the Site, including provision to the satisfaction of the Water Authority of any storage tanks so that sufficient potable water is always available for the execution of the Works. Suitable provision shall be made where the Water Authority requires the use of salt water for flushing purposes.

(3) Site Communication Facilities

Where required under the Contract, the Contractor shall install efficient means of Site communications including messenger, telephone and, where appropriate, two-way radio to the satisfaction of the Engineer.

(4) Temporary Drainage & Sewage Disposal

Where required under the Contract, adequate provision shall be made for the discharge or disposal from the Site of all water, surplus fluid sewage and waste products and the method of disposal shall be submitted to the Engineer for review. The Site shall be kept well drained and free from standing water. Where existing channels and gullies cannot be maintained, temporary drainage arrangements shall be provided.

13.3.4 The Engineer will instruct the Contractor as to the requirements for Site services to be connected to the Engineer's portable Site accommodation at any given location and the Contractor shall provide and maintain these services during his use of the Site.

13.4 Site Cleanliness

13.4.1 The Site shall be maintained in a clean and tidy condition. Materials, including materials required for Temporary Works shall be stored in an orderly manner. Rubbish, debris, cement bags, disused formwork and the like shall be disposed of at least once a day and the work area cleaned by flushing with water as necessary so that the Site is kept constantly clean and tidy. Notwithstanding the above, the Contractor shall place rubbish bins at strategic locations about the Site. The Contractor shall throughout the period of the Contract provide a central collection point on Site, as reviewed without objection by the Engineer, for collecting all empty cans, drums, packing and other receptacles capable of holding water. The Contractor shall procure the regular collection and removal of such debris from the Site. After every shift of works, all work areas shall be cleaned and made tidy to the satisfaction of the Engineer.

The Contractor shall ensure that no earth, debris, rock or empty cable drums are deposited on public or private rights of way as a result of the Works, including any deposits arising from the movement of Contractor's Equipment. All roads, both within and external to the Site which are affected by the Works shall be kept in a clean condition by the Contractor. All haul roads shall be regularly graded and watered, as necessary to minimise dust nuisance. .

13.5 Prevention of Mosquito Breeding

13.5.1 Measures shall be taken to prevent mosquito breeding on the Site. The measures to be taken shall include the following:

(1) empty cans, oil drums, packing and other receptacles which may retain water shall be deposited at a central collection point and those not required for future use shall be removed from the Site regularly;

(2) standing water shall be treated at least once every week with an environmental acceptable oil which will prevent mosquito breeding; and

(3) Contractor's Equipment and other items on the Site that may retain water shall be stored, covered or treated in such a manner that water will not be retained.

13.5.2 Posters in both English and Hindi drawing attention to the dangers of permitting mosquito breeding shall be obtained from the Rajasthan Government and displayed prominently on the Site, to the requirement of the Enactments. These posters shall be removed on Employer's Taking Over of the Works.

13.6 Prevention of Dust

Work shall be carried out in such a manner that avoidable dust is not generated. Areas of the Site in which dust is likely to be generated shall be sprayed with water regularly. Screens, dust sheets, tarpaulins or other methods reviewed by the Engineer shall be used to prevent generation of dust. Materials, including earthworks material, from which dust may be generated when being transported to or from the Site shall be sprayed with water or covered. The location and size of material stockpiles, including excavated materials within the Site, shall be subject to review by the Engineer. All stockpiles shall be maintained at all times in a safe manner.

13.7 Engineering Conditions for Temporary Land Allocation

The Contractor shall comply with the obligations, requirements and restrictions described in the PS in respect of the Contractor's work areas if any.

13.8 Attendance by Civil Works Project Contractor

13.8.1 Where supplies of electricity, water, compressed air, temporary ventilation, temporary lighting, etc. are installed by the Civil Works Project Contractor for use during construction of the structural components of the Project, these services may be made available to the Contractor for his own use during erection, installation and testing of the Works in accordance with Chapter 18 below.

13.8.2 The Contractor shall supply the Engineer with its requirements (if any) for such services within 90 days of the Commencement Date of the Works. Upon receipt of the Contractor's declaration, the Engineer will ascertain whether any of these requirements can be satisfied by the installations installed by the Civil Works Project Contractor. The Engineer will subsequently notify the Contractor of the result of these investigations.

13.8.3 Where services are required and are not available from the Civil Works Project Contractor, the Contractor shall provide, test, maintain and subsequently remove the services.

13.9 Transportation to Site

13.9.1 The Contractor shall use such routes and rights of entry to the Site as may be decided by the Engineer from time to time. Routes for very large or very heavy loads shall be discussed with the Engineer in advance of the need arising and all arrangements therefor shall be submitted for review by the Engineer.

13.9.2 In this context, the definition of the terms "very large" and "very heavy" refer to articles that cannot be transported by normal road vehicles or be handled by readily available methods. Where doubt exists, it shall be the responsibility of the Contractor to notify and discuss the nature of the load in question with the Engineer in accordance with clause 13.9.1 above.

13.9.3 The Contractor shall comply with the requirements of the Commissioner of Transport and /or the Commissioner of Police and / or any other Relevant Authority regarding any special traffic arrangements that may be necessary. The Contractor's attention is drawn to the Road Traffic (Regulation and Licensing of Vehicles) Regulations and the Road Traffic (Construction and Use) Regulations currently in use at Jaipur.

13.9.4 Extraordinary traffic may be moved from docks and between areas of the Site over public highways only by police escort and on a route and at a time determined by the Relevant Authority. The Contractor shall be responsible for obtaining permission from the Relevant Authorities to move extraordinary loads and traffic and for arranging police escorts as necessary.

13.9.5 The Contractor shall make all arrangements and assume full responsibility for transportation to the Site of all Contractor's Equipment, materials and supplies needed for the proper execution of the Works.

13.9.6 While travelling to and from the Site, the Contractor shall observe all posted speed limits, traffic regulations, stop signs, etc., and adherence to the access route indicated on the Employer's Drawings or as instructed by the Engineer. No employee of the Contractor shall trespass into any part of the Employer's premises other than the Site or the designated route of access.

13.9.7 The Contractor shall ensure that all roads and pavements, etc. leading to and around the Site are kept free from obstructions and shall not cause inconvenience or hindrance to traffic or persons either by its vehicles or by its workmen, scaffolding, plant, materials, equipment, etc.

13.9.8 The Contractor shall repair damage to existing roads, footpaths, steps, cables, sewers, live drains, etc. and shall reinstate any damage caused by the Contractor's actions.

13.10 Contractor's Own Rolling Stock

13.10.1 Where the Contractor is to provide rolling stock (either self-propelled or trailing) for use during the installation and testing of the Works, the requirements of clause 13.11 below shall apply. All the Contractor's own rolling stock shall not cause any infringement any where..

13.10.2 The Contractor shall submit full details of any rolling stock that is to be used during the installation and testing of the Works to the Engineer for review within 90 days of the Commencement Date of the Works. Such details shall include a full description and drawings of the rolling stock, details of axle load, stopping distance, fail-safe braking system, kinematic envelope, and operating and maintenance instructions.

13.10.3 The Contractor shall maintain its own rolling stock during the installation and testing of the Works. The maintenance work shall be carried out by qualified and experienced personnel, whose qualifications have been reviewed without objection by the Engineer, in accordance with the maintenance procedures that shall have been reviewed without objection by the Engineer.

13.10.4 Prior to use, and following each maintenance examination, the Contractor's qualified engineer shall certify the Contractor's own rolling stock as fit-to-run. Thereafter, the Contractor's qualified engineer shall issue a registration tag. The expiry date, i.e. the date of the next inspection, shall be shown on the registration tag. The Contractor's own rolling stock shall not be used without a valid registration tag.

13.10.5 The Contractor shall establish a maintenance programme for his own rolling stock and shall submit the maintenance programme for review by the Engineer prior to the delivery of his own rolling stock to the Site. The Engineer will periodically inspect the Contractor's own rolling stock to ensure it is properly maintained to the standards set out in the maintenance programme.

13.10.6 If the Contractor's own rolling stock is found to be operating in an unsatisfactory or unsafe condition, it shall be immediately removed until it has been restored to an acceptable condition to the satisfaction of the Engineer.

13.11 Defined Area Working and Works Train Operations

13.11.1 When the Project under construction has been made available for track related electrical and mechanical installation works, the area will be classified as a Defined Area within which Works Trains will be operated.

13.11.2 All persons whose duties require them to work within a Defined Area must observe safety rules and procedures to be provided by the contractor and reviewed without objection by the Engineer. It shall provide procedures and guidance for the safety of all persons in the Defined Area.

13.11.3 The Contractor shall establish communicate the rules and procedures, which shall be published from time to time, to their workers and/or agents on Site, and to ensure all such rules and procedures are being observed in the course of all works and construction activities.

13.11.4 Persons working on or near tracks in a Defined Area, either by themselves or supervising a working party, must be suitably trained and qualified by the Engineer/Employer or his delegates in the safety provisions of the Works Train Manual. Persons who are not qualified shall not attempt to gain access to the railway tracks unless accompanied by a qualified person.

13.11.5 When overhead lines are energised, EMUs may be running at high speed for testing. No work may be undertaken on either the Up or Down tracks when test trains are running. Procedures for gaining access to the energised track will be detailed in the Works Train Manual. The Contractor shall make requests for gaining access to the energised track at the weekly Works Train Meetings.

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CHAPTER 14

14. HEALTH AND SAFETY

14.1 Health and Safety Philosophy

14.1.1 The health, safety and welfare of all personnel working on the Project, the general public and the avoidance of damage to property are of paramount importance to the Employer. Prime consideration shall be paid to construction activities to ensure that all operations shall be conducted in such a manner as to eliminate the risks to persons and property. The Contractor shall treat safety measures as the first priority in all his activities with respect to executing the Works.

14.1.2 The Contractor will be issued with the following JMRC documents: Corporate Safety Standards, Safety Policy, Safety Plan, Safety Procedure Rule Book and Joint Operating Procedure as they become available. These documents set out the minimum standards to be achieved by the Contractor but do not relieve the Contractor of his liabilities and obligations under the Enactment. Where there is a discrepancy in the documents, the higher or stricter standards shall be applied.

14.1.3 The engineer will issue to the contractor the Employer's project safety manual And any revised version thereof as may from time to time be produced by time to time be produced by the Employer. The contractor shall comply with the requirements of the Project Safety Manual provided by the standards set out in the project safety manual shall be regarded as the minimum to be achieved an shall not relieve the contractor of any of his statutory duties of his responsibilities under the contract.

14.1.4 The provisions of the Contract regarding safety shall apply and to be binding upon the Contractor for any part of the works and the person employed as sub-contractor of any tier. The contractor shall ensure that the requirements of the contract in respect of safety are included in all sub-contracts placed by him.

14.1.5 The Engineer reserves the right to order the immediate removal and replacement of any item of Contractor's Equipment or Temporary Works which in his opinion, is unsatisfactory for its purpose or is in unsafe condition.

14.2 Health and Safety Management

14.2.1 The Contractor shall be fully responsible for safety on the Site, for the Works, his personnel, sub-contractors' personnel, the public domain and all persons directly or indirectly associated with the Works, on or in the vicinity of the Site.

14.2.2 The Contractor shall submit reports, notices and information to Government bodies where there is a statutory requirement to do so.

14.2.3 The Contractor shall and will ensure that, his sub-contractors of any level, all persons employed by him on the Site and any person authorised by him to be on the Site shall comply in every respect with the provisions of relevant statutory requirements and the Employer's safety documents as listed in clause 14.1.2 above.

14.2.4 The provisions of the GS regarding health and safety shall apply to the Contractor and his sub-contractors of any level for any part of the Works.

14.2.5 The Contractor shall ensure that proper and adequate provisions to ensure compliance are included in all sub-contracts placed by him and into all sub-contract documentation.

14.2.6 The safety standards of the sub-contractors are to be properly assessed prior to the placing of contracts and the Contractor shall employ only sub-contractors with a track record of maintaining the highest safety standards.

14.2.7 The Engineer reserves the right to order the immediate removal and replacement of any item of Contractors equipment or temporary works, which in his opinion, is unsatisfactory for its purpose or is in an unsafe condition.

14.3 Legislation, Codes of Practice, Standards, etc.

14.3.1 The Contractor shall comply with all current and future Enactments, Codes of Practice and Safety Guides approved by the Rajasthan Government relating to the Works.

14.3.2 Where identified specifically in the GS and due safety Project Manual, Indian Standards are also to be complied with.

14.4 Breach of Health and Safety Obligations

14.4.1 Serious or repeated breaches of the Employer's safety documents as listed in clause 14.1.2 above, statutory regulations, or other disregard for the health and safety of any person, may be reasons for the Engineer to exercise his authority to require the removal from the Site of any employee of the Contractor or a sub-contractor of any level.

14.4.2 Once removed from the Site at the request of the Engineer, that person shall not be re-employed on the Contract, allowed on the Site or on any other DMRC/JMRC related project.

14.4.3 The Engineer shall have the right to order the suspension of any or all of the Contractor's activities where the Engineer considers that to continue such activity or activities may pose a hazard to the safety of persons or property.

14.4.4 Where the Engineer orders such suspension as described in clause 14.4.3 above, such suspension shall continue until the Contractor has satisfied the Engineer that satisfactory corrective action has been taken to eliminate the hazard, the subject of the suspension

14.5 Contractor's Health and Safety Documentation

14.5.1 Outline Safety Plan

For the purpose of this clause "Outline Safety Plan" means the Contract specific safety plan forming part of the tender setting out in summary form the Contractor's proposed means of complying with its obligation in relation to safety and industrial health, and "Site Safety Plan" means the site safety plan including all the supplements thereto, or any amended or varied version thereto, as submitted by the contractor in accordance with this clause and consented by the Engineer.

14.5.2 Site Safety Plan

14.5.2.1 The Contractor shall devise and implement a Site Safety Plan developed from the Outline Safety Plan submitted and developed during the Tender period.

14.5.2.2 The Site Safety Plan shall fully comply with the Health and Safety requirements of the Project conditions and proposed work activities, the GS, the Employer's Safety documents as listed in clause 14.1.2 above and all relevant Enactment, Regulations, Codes of Practice, Safety Guides and relevant Indian Standards. The plan shall be prepared and submitted to the Engineer for review within 30 days of the date of Notice to Proceed.

14.5.2.3 The Site Safety plan should contain as a minimum those items set out in the following clauses of the GS.

The Site safety plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance with this clause 14.5.2 . The Site Safety Plan shall include but not be restricted to:

a) A statement of the Contractor's policy, organisation and arrangements for safety, health and welfare;

b) The names and experience of persons within the contractors proposed management who would be responsible for co-ordinating and monitoring the Contractors Safety Performance;

c) The number of safety staff who would be employed on the works, their responsibilities, authority and line of communication with the proposed contractors agent.

d) A statement of the contractors policy and procedures for identifying and estimating hazards, and the measures for addressing the same;

e) A list of safety hazards and health hazards anticipated for this contract and sufficient information to demonstrate the contractors proposals for achieving effective and efficient health and safety procedures;

f) A description of the training courses and emergency drills which would be provided by the contractor, with an outline of the syllabus to be followed.

g) Details of the safety equipments which would be provided by the contractor, including personal protective equipment;

h) A statement of the contractors policy and procedures for ensuring that contractors equipment used on the project site are maintained in a safe condition and are operated in a safe manner;

i) A statement of the contractors disciplinary procedures for ensuring that sub-contractors comply with the contractors safety plan.

j) A statement of the contractors disciplinary procedures with respect to safety related matters, and

k) A statement of the contractors procedures for reporting and investigating accidents, dangerous occurrences or occupational illness.

14.5.2.4 The contractor shall from time to time 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 or its site safety and industrial health obligations, responsibilities, policies and procedures (under the laws of India or as stated in this clause or elsewhere in the contract) relating to the work on site. Any and all submissions to the Engineer of supplements to the Site Safety Plan shall be made in accordance with the agreed procedures.

14.5.2.5 If at any time the safety plan is, in Engineer opinion 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 Employers Representative may instruct the contractor to revise the Safety Plan and the contractor shall within fourteen days submit the revised plan to Engineer for review.

14.5.2.6 Any omission and errors in the Site Safety Plan or the Engineer acceptance or rejection of the Site Safety Plan and/or supplements thereto shall be without prejudice to the contractors obligations with respect to the Site Safety and industrial health and shall not excuse any failure by the contractor to adopt proper and recognised safety practices throughout the execution of the works.

14.5.2.7 The contractor shall adhere to the Site Safety Plan and shall ensure, as far as practically possible, the all sub-contractors of all tiers require that contracting parties each have a copy of the Site Safety Plan and comply with its provisions.

14.5.2.8 The contractor shall provide all necessary access, assistance and facilities to enable the Employer Representative and the Employer to carry out surveillance to verify that the site Safety Plan is being properly and fully implemented.

14.5.2.9 The contractor shall provide its sub-contractors with copies of the Site Safety Plan and shall incorporate into all sub-contract documentations provisions to ensure the compliance with such plan at all tiers of the sub-contracting.

14.5.2.10 The contractor shall, unless the Engineer consent in writing is given, require all sub-contractors to appoint a safety representative who shall be available on the site throughout the operational period of the respective sub-contract. In the event of the Engineer consent being given, the Safety Officer or Safety Staff, without prejudice to their duties and responsibilities, shall ensure, as far as is practically possible, the employees of sub-contractors of all tiers and conversant with appropriate parts of the Site Safety Plan and the statutory regulation.

14.5.3 Sub-contractors documentation

14.5.3.1 The Contractor's and his Sub-Contractors health and safety documentation shall be consistent. As new sub-contractors are mobilised on site the Contractor shall ensure that each is issued with copies of the Corporate

Safety Documents and each sub-contractor complies with the established health and safety documentation procedures.

14.5.3.2 The Contractor shall submit to the Engineer for review a Works specific copy of his Health and Safety Manual and his Health and Safety Plan for review within 30 days of the Commencement Date of the Works.

14.5.3.3 The Contractor shall provide his sub-contractors with copies of the Health and Safety Manual and the Health and Safety Plan, risk assessments and method statements.

14.5.4 Health and Safety Manual

The Contractor's Health and Safety Manual shall contain the procedures required for carrying out the work activities on the Project and is to be regularly reviewed and up-dated to reflect changes to work practice and changes to Enactment. Copies of proposed changes are to be submitted to the Engineer for review prior to inclusion and implementation.

14.5.5 Risk Assessments

14.5.5.1 The Contractor shall carry out a detailed risk assessment covering the occupational health and safety aspects of the Works.

14.5.5.2 The documentation arising from this exercise shall contain a comprehensive schedule of all perceived risks and the proposed resolution or mitigation measures necessary to reduce these risks to a minimum.

14.5.5.3 The results of such assessments shall be recorded and the records kept for inspection by the Engineer.

14.5.6 Method Statements

14.5.6.1 In order to ensure that health and safety has been properly considered at the planning stage, the Contractor shall submit to the Engineer for review, detailed method statements for each construction task as the Engineer requires.

14.5.6.1.1 The contractor shall produce and implement a permit to work system for all high risk operations. The permit to work system shall be submitted to the Engineer for consent before application.

14.5.6.2 Method statements shall be logical construction guides designed for the use by the Engineer on Site. They shall contain a detailed risk assessment, which shall include the task or operation, a hazard analysis and methods for preventing injury, including personal protective equipment and any pertinent safety measures to be adopted.

14.5.6.3 Detailed programme showing what method statements will be written and when they will be submitted shall be produced and submitted to the Engineer within 30 calendar days of the Commencement Date of the Works or at a date reviewed by the Engineer.

14.5.6.4 Method statements shall be reviewed by the Engineer prior to any work commencing on the task described. Accordingly, the Contractor shall ensure that such statements are prepared in sufficient time to allow a review before the proposed programmed start date for the relevant task.

14.5.6.5 Before formal issue to the Engineer, the engineer in charge of the described works and the Contractor's authorised representative shall sign the method statement.

14.5.6.6 After review by the Engineer, a copy will be held in the safety office to facilitate monitoring of the work and a further copy shall be given to the engineer supervising the work. The original shall be retained in the Contractor's files for audit purposes.

14.6 Contractor's Safety Arrangements

14.6.1 Co-ordination of work activities

14.6.1.1 The Contractor shall ensure that work is to be co-ordinated throughout the Project to ensure that the activities of one group of workers does not affect the safety of another group, e.g., scaffolders working above cable layers, etc.

14.6.1.2 Daily meetings are to be held to co-ordinate the work activities and permits to work are to be issued as and when required.

14.6.2 Safety inspections

14.6.2.1 The Contractor shall conduct formal, documented Site safety inspections (at least once a month) which are to be attended by the Contractor's most senior Site staff and safety staff.

14.6.2.2 A report of each safety inspection shall be made and shall include the actions taken to resolve any problems or shortcoming discovered during the inspection. The report shall be made available for audit purposes and be discussed at the relevant meetings.

14.6.2.3 A comprehensive health and safety inspection check-list for the use of the Contractor's Site staff when inspecting the Site is to be formulated and submitted for review by the Engineer.

14.6.2.4 The checklist shall indicate the standard to be achieved on any particular aspect of health and safety and be compiled in such a way that allows the inspector to enter his or her actual findings for comparison against the said statement and subsequent rectification.

14.6.2.5 When completed, the checklist shall be kept for record purposes and be made available to the Engineer for audit purposes.

14.6.2.6 A grading system is to be established which grades the area inspected as either "Very Good", "Good", "Acceptable", "Poor" or "Un-acceptable".

14.6.2.7 Where an area receives a grading below "Acceptable", immediate action is to be taken to rectify the problems raised and a further audit shall be conducted after 7 days to assess the conditions.

14.6.2.8 The Contractor is to advise the Engineer of the date of the monthly inspection. The Engineer may send a representative to assess the thoroughness of the inspection.

14.6.3 Safety audits

14.6.3.1 The Contractor will be subjected to the Employer's Safety Performance Measurement Scheme, which is based upon a series of audits carried out or to be carried out, the extent, scope and at a frequency determined by the Engineer, to measure the Contractor's compliance with the provisions of the Employer's safety documents as listed in clause 14.1.2 above, the Enactments, Contractor's Health and Safety Manual and Site Plan.

14.6.3.2 The Employer's audit will be graded as follows: "Very Good", "Good", "Acceptable" or "Un-acceptable".

14.6.3.3 Where the Contractor receives a grading of "Un-acceptable", immediate action shall be taken to rectify the problems raised and a follow up audit shall be conducted within 30 days to assess conditions and ensure that remedial action has been taken.

14.6.3.4 The Contractor shall continue to be audited, every 30 days, until such time as a grade of "Acceptable" or above has been achieved.

14.6.3.5 The Employer's auditors shall be used for the follow up audit(s) and the Contractor shall be liable for the full costs incurred of all additional follow up audits.

14.6.3.6 The Contractor shall conduct regular (at least every 3 months) internal safety audits on both the safety management system and the physical Site conditions. The internal safety audits shall be performed to the same criteria and using the same grading and benchmarking as the Employer's audits.

14.6.3.7 The internal safety audits shall be conducted by person(s) reviewed without objection by the Engineer, who are qualified and competent to carry out safety audits. The documentation generated by the audit process, including score sheets, shall be made available to the Engineer for audit purposes.

14.6.3.8 The internal safety audits shall include the work of sub-contractors of all levels.

14.6.3.9 The Contractor shall advise the Engineer of the date of the internal safety audit. The Engineer may send a representative to assess the thoroughness of the internal safety audit.

14.6.4 Reporting of accidents, incidents and dangerous occurrence

14.6.4.1 The Contractor shall notify the Engineer/Employer immediately of any dangerous occurrences or accidents, which result in death, serious bodily injury or incapacity for more than 3 days. Such initial notification may be verbal but shall in any event be followed by a preliminary written report, in a format reviewed without objection by the Engineer, within 24 hours of the occurrence/accident and a detailed written report shall be submitted within 7 days. Copies of all accident, incident and dangerous occurrence reports shall be kept on file and made available for audit purposes.

14.6.5 Monthly reports

14.6.5.1 The Contractor shall, as part one of each Monthly Progress Report, submit a Site Safety Report duly signed by the Contractor's director responsible for the Contract.

14.6.5.2 The Site Safety Report shall comprehensively address all relevant aspects of occupational safety and health and shall contain certain standard forms and information, as directed by the Engineer, for statistical analysis.

14.6.5.3 The Contractor shall submit reports or accident analysis, in a format reviewed without objection by the Engineer, as and when required by the Engineer.

14.6.6 Safety staff

14.6.6.1 The contractor shall appoint a Safety Officer whose duties will be throughout the period of the contract and shall be entirely connected with the safety and industrial health aspects of the Contractors activities on the site. The safety officer shall be suitably qualified and experienced person who shall supervise and monitor compliance with the site safety plan. The safety officer shall, in particular but without limitation, carry out auditioning of the operation of the site safety plan in accordance with a rolling program to be submitted, from time to time, the Engineer for his consent. The Safety officers appointment shall be within twenty eight (28) days of the date of acceptance of Tender and shall be subject to the Engineer written consent.

14.6.6.2 The contractor shall not undertake any works on the site until the safety officer has commenced duties in Jaipur unless the Engineer has specifically consented in writing.

14.6.6.3 Without prejudice to the generality under clause of the General conditions of contract, the contractor shall not remove the Safety officer from the site without the express permission of the Engineer within fourteen (14) days of any such removal or notice if intent of removal, the contractor shall nominate a replacement Safety Officer for the Engineer consent.

14.6.6.4 The contractor shall provide the safety officer with supporting staff in accordance with the staffing levels set out in the site safety plan. The supporting staff shall include at least one (1) Deputy Safety officer whose appointments shall be subject to the Engineer consent under similar criteria to those contained under clause 14.6.6.1 above. The Deputy Safety Officer as contained in the Site Safety Plan whenever necessary.

14.6.6.5 The contractor shall empower the safety officer and safety staff to instruct employees of the contractor or of its sub-contractors of any tiers to cease operations and take urgent and appropriate action to make safe the site and prevent unsafe working practices or other infringements of the site safety plan or the statutory regulations.

14.6.6.6 The contractor shall ensure that the safety officer maintains a daily site safety diary, such diary comprehensive recording all relevant matters concerning site safety, safety inspections and audits, safety related incidents and the like. The site safety diary shall be reviewed and signed on a weekly basis by the site agent and shall be available at all times for inspection by the Engineer.

14.6.6.7 The contractor staff organisation plan shall show direct lines of communication and reporting between the safety officer and the site agent and between the safety officer and the director responsible for the contract. The contractor shall instruct and require the site agent and the Director responsible to be directly accountable in all matters concerning site safety.

14.6.7 Safety promotion and incentive schemes

The Contractor shall actively promote and encourage the standards of health and safety on the Site and implement safety incentives and award schemes at all levels of management, supervisors, foremen, workers, etc. The Contractor shall be able to demonstrate to the Engineer that this requirement is being carried out to the Engineer's satisfaction.

14.6.8 Safety information

14.6.8.1 The Contractor shall display in each of his Site offices, workshops and canteens a copy of the document on "A Guide to the Construction Sites (Safety) Regulations" published by the Government or a similar approved document. This document shall be translated into languages, which are understood by labour engaged by the Contractor or sub-contractors.

14.6.8.2 The Contractor shall ensure that safety, rescue and occupational health matters are given a high degree of publicity to all persons, regularly or occasionally on Site. Posters in English, Hindi and other languages understood by the workers, drawing attention to Site safety, rescue and occupational health, shall be made or obtained from appropriate sources and shall be displayed prominently in relevant areas of the Site.

14.6.8.3 Posters in both English and Hindi drawing attention to safety shall be obtained from the National Safety Council and displayed prominently throughout the Site.

14.6.8.4 The Contractor shall keep on Site a complete and up-to-date set of all relevant occupational health and safety legislation, relevant Codes of Practice and any relevant guides and safety pamphlets published by the National Safety Council.

14.6.9 Safety meetings

14.6.9.1 The Contractor shall establish a monthly Site Safety Management Committee to formally review the safety management on the project and monitor the implementation of the site and Safety Plan. The most senior site manager shall act as chairman of this committee with members of the Engineer's staff attending as appropriate.

14.6.9.2 Attendance from the Contractor shall include, but not be limited to, the Senior Manager on Site and the Safety Manager/Officer/Supervisor and representatives from all sub-contractors.

14.6.9.3 The Contractor shall act without delay upon such decisions or recommendations as may be made by the committee on matters of health and safety.

14.6.9.4 The Engineer as appropriate may invite representatives from third parties.

14.6.9.5 The Contractor shall establish a tier of monthly safety meetings and shall ensure that all level of staff, all disciplines and all work areas are covered so that the dissemination of information is carried through to all levels of staff and workers.

14.6.9.6 Minutes of all tiers of Contractor safety meetings shall be issued to the Engineer for information.

14.6.10 Safety training

14.6.10.1 The Contractor shall ensure that induction training courses shall be provided for construction site workers or equivalent.

14.6.10.2 The induction course shall be conducted by suitably qualified persons and repeated at six-month intervals.

14.6.10.3 All workers must receive induction training before they are allowed to commence work on the Site.

14.6.10.4 The Contractor is to issue all Site workers with a Site pass once they have attended the induction course. The pass is to include the worker's name, HK, photograph, types of courses attended and expiry date of the card (maximum 6 months). The pass is to be carried at all times when on the Site.

14.6.10.5 The Contractor shall keep records of such training for health and safety audit purposes. Upon completion of their training, the Contractor's Site staff shall sign a copy of their assigned safety responsibility statement, which shall be kept by the Contractor for audit purposes.

14.6.10.6 The Contractor is to report the number of training sessions and employees trained each month, at the Site Safety Management Committee meeting and in the Monthly Progress Report.

14.6.11 Alcohol and drugs

14.6.11.1 The Contractor shall ensure that alcoholic drinks, drugs and other substances, which may impair judgement, are not sold, introduced or consumed on the Site.

14.6.11.2 The Contractor shall ensure that his personnel and those of his sub-contractors of any tier, are not under the influence of alcohol or any substance which may impair judgement whilst on the Site or otherwise engaged in the execution of the Works.

14.6.11.3 The Contractor shall immediately remove or cause to be removed from the Site any person employed by the Contractor or his sub-contractors of any tier who is found to be under the influence of alcohol, drugs or any other substance which may impair judgement. Such person shall not be employed again in connection with the Works or on the Project without the prior consent of the Engineer.

14.7 Site Conditions

14.7.1 Emergency procedures and facilities

14.7.1.1 The Contractor shall establish and implement emergency procedures which detail the organisation of rescue and/or damage limitation teams to deal with emergency situations on the Site such as, but not limited to, fire, loss of power, monsoon, flooding, stranding or the evacuation of a seriously injured person(s) from a remote or difficult Site location, etc. The emergency procedures shall specify what equipment is needed, where it will be located and who is responsible for its maintenance.

14.7.2 First aid facilities

14.7.2.1 The Contractor shall provide, or have access to, sufficient first aid provisions, including trained personnel and facilities appropriate to the Site conditions. Arrangements for transporting the injured (ambulance, stretcher, etc.) shall be provided.

14.7.2.2 A Nurse or trained First-Aider is required at all times at the Site of working.

14.7.2.3 The Contractor shall maintain a register of all persons attending the clinic or receiving first aid treatment. Records are to be in a comprehensive format and shall be kept for audit purposes.

14.7.2.4 First aid kits, up to the standards required by the appropriate authority shall be carried in supervisor's vehicles and made available where work is in remote areas.

14.7.3 Lifting appliances and lifting gear

14.7.3.1 The contractor shall provide and maintain safe mechanical cranes. Hoists and conveying facilities for the lifting and transport of materials and shall comply with all relevant requirements of IS 807 code of practice for the design and manufacturing testing and commissioning of cranes. All cranes, hoists and the like shall be fitted with audible overload warning devices. All such equipments shall be regularly maintained in accordance with manufactures recommendations and standards having regard to local legislation and recommendations from the appropriate statutory authority.

14.7.3.2 Prior to use on site, all lifting appliances and lifting gear shall be tested to an approved safety margin and suitably identified in accordance with the requirements of the current legislation. The test certificates shall be submitted to the Engineer for review prior to the use of such equipment on site.

14.7.3.3 The safe working load shall be clearly and indelibly marked on all lifting appliances and lifting gear either by stamping or by the addition of permanently secured tag labels.

14.7.3.4 The contractor shall prepare and maintain an up-to-date register containing test certificates of all lifting and hoisting equipment used on the works. The contractor shall notify the Engineer the person responsible for maintaining this register. The register shall, form the commencement of construction, be available on site for inspection by the Engineer and relevant Authorities.

14.7.3.5 Competent operators with certificates certifying that the proposed operator has received training in the general principles of carne operation and specific training in the type of lifting of hoisting equipment he is required to operate shall be provided for the control of all lifting and hoisting equipment.

14.7.3.6 A system is to be devised and implemented, such as colour coding, to identify the expiry of the certification of lifting appliances and lifting gear. This system is to be displayed in the cabs of all lifting appliances.

14.7.3.7 A trained banksman shall be in attendance at each lifting appliance or hoisting operation.

14.7.3.8 The banksman shall be equipped with a radio link to the crane or hoist operator and shall be easily identifiable from other workers.

14.7.3.9 The operators of shaft hoisting gear shall be in communication with the top and bottom of the shaft and each intermediate landing.

14.7.3.10 All crane hooks and other lifting devices used on or around the Site shall be fitted with a safety catch or other device to stop the lifting gear being detached.

14.7.3.11 The safe working load shall be clearly and indelibly marked on all lifting equipment, either by stamping or by the addition of permanently secured tag labels. Stamping shall not be permitted on any stress bearing part.

14.7.3.12 Slings, shackles and such-like equipment used in lifting shall be colour coded for identifying lifting gear which require re-inspection or disposal.

14.7.4 Fire precautions

14.7.4.1 The Jaipur Fire Service prevention and fire safety act and any relevant regulations made there under and other requirements laid down in the Specification or as laid down from time to time by the Engineer shall be observed at all times.

14.7.4.2 The Contractor shall thoroughly assess the risk of fire throughout the Site and shall develop a comprehensive fire control strategy as a part of the Site Safety Plan, which will extend to all aspects of the Works. The fire control strategy shall be discussed regularly and reviewed with the Engineer.

14.7.4.3 Adequate and suitable fire extinguishers are to be positioned throughout the Site, with particular attention paid to offices, flammable storage areas, , workshops, etc.

14.7.4.4 Adequate and suitable fire extinguishers are to be provided at all hot work locations.

14.7.4.5 The Contractor shall ensure that all persons on the Site are trained in and undergo regularly refresher courses in the use of fire extinguishers.

14.7.4.6 Fire points are to be clearly designated.

14.7.5 Dangerous goods, hazardous substances

14.7.5.1 The Contractor shall obtain the requisite licenses for the manufacture, storage, handling and use of all dangerous goods.

14.7.5.2 The Contractor shall ensure that all explosives, compressed gases, petrol and other dangerous substances, shall be stored and handled in accordance with the relevant legislation.

14.7.5.3 Before being brought on to Site, any materials proposed by the Contractor shall be assessed by the Contractor for their occupational health and environmental compatibility. Any material that is toxic, explosive or inflammable or may otherwise create a hazard shall, whenever possible, be replaced by a less hazardous product. Where this cannot be done, the Contractor shall conduct a risk analysis and produce a method statement specifying the safe method of use and all associated precautions including personal protective equipment.

14.7.5.4 All hazardous substances and dangerous goods brought onto the Site shall be entered into a Site register.

14.7.5.5 The Contractor shall ensure that material safety data sheets are available and issued to workers, for all hazardous substances brought onto the Site.

14.7.5.6 The Contractor shall make adequate provision for the storage and disposal of waste oils, de-greasing agents, etc.

14.7.5.7 Flash back arrestors and pressure gauges shall be fitted to all oxygen and acetylene cylinders.

14.7.5.8 Oxygen and acetylene cylinders shall be stored and used in a vertical position and be transported upon a trolley or in cage.

14.7.6 Radiation protection

14.7.6.1 The use of radioactive substances and radiating apparatus shall comply with the government regulatory requirements and all subsidiary legislation.

14.7.6.2 Operations involving ionising radiation shall only be carried out after having been reviewed without objection by the Engineer and shall be carried out in accordance with a method statement.

14.7.6.3 Each area containing irradiating apparatus shall have warning notices and barriers, as required by the Regulations, conspicuously posted at or near the area.

14.7.6.4 Radioactive substances will be stored, used or disposed shall be strictly in accordance with the Government Enactments.

14.7.6.5 The Contractor shall ensure that all Site personnel and members of the public are not exposed to radiation.

14.7.7 Excavations and floor openings

14.7.7.1 Before the commencement of any excavation work, sufficient information shall be obtained from the utility companies to identify the locations of buried services. Buried services are to be located using a cable detector, digging hand dug trial pits and by reference to the relevant drawings, before mechanical digging takes place.

14.7.7.2 Excavations shall be carried out by trained and experienced workers who shall be fully instructed on the possible dangers and safety precaution to be taken, before work is commenced.

14.7.7.3 The Engineer shall be notified immediately of any damage or interruption to a utility.

14.7.7.4 A Permit to Dig system shall be established and implemented prior to excavation starting.

14.7.7.5 The Contractor shall ensure that all temporary covers/decking to the trenches and barriers at the edges of excavations are safe and securely installed at all times, especially during adverse weather conditions.

14.7.7.6 Where there is a danger to the public, extra care must be taken to properly cover all temporary openings and adequately barrier and sign the excavation.

Flashing warning lights, signs and adequate lighting is to be installed where required.

14.7.8 Site transport

14.7.8.1 The Contractor shall ensure that all Site vehicles are regularly maintained and kept in a safe condition with fully working brakes, lights, exhaust, windscreen, windows and doors, etc.

14.7.8.2 Each vehicle, piece of plant or machinery shall be uniquely and clearly identified and registered for maintenance purposes.

14.7.8.3 When instructed by the Employer or the Engineer, the Contractor will remove any vehicle from the Site that is not up to the standards required.

14.7.8.4 The Contractor will remove from the Site immediately any vehicle that is beyond repair. The Site shall not to be used as a scrap yard.

14.7.8.5 The Contractor is to ensure that only vehicles fitted with seats with backrests and seat belts are used as Site transport. If required by law the carrying of passengers in vehicles that have not been fitted with seat belts is strictly prohibited. No person shall ride in the back of vehicles not legally authorised to carry passengers. Drivers of vehicles permitting this practice are to be warned for a first offence then removed from the Site for the second offence.

14.7.8.6 The speed limit on the Site is to be restricted to 5 Kmph and signs displayed advising drivers of the limits imposed.

14.7.8.7 Speed bumps are to be located at strategic points throughout the Site to enforce the speed limits.

14.7.9 Driving/operator's licenses

Drivers of vehicles and operators of the Contractor's Equipment shall hold the necessary license group for the vehicle or plant they are driving/operating. Where no such license group exists, drivers/operators shall have an equivalent group and undertake training in the vehicle/plant given by the Contractor's plant department. Records of the training given are to be retained.

14.7.10 Personal protective equipment (PPE)

14.7.10.1 The Contractor shall make available on Site at all times adequate provision of safety equipment including, but not limited to, safety helmets, goggles, ear protectors, safety belts, respiratory protection, safety equipment for working in sewers, drains and enclosed spaces, equipment for rescue from drowning, fire extinguishers, first aid equipment and other necessary safety equipment.

14.7.10.2 The Contractor shall ensure that safety footwear and safety helmets are worn at all times by all persons on site.

14.7.10.3 High visibility vests shall be worn at all times when in the tunnels.

14.7.10.4 Persons shall sign for all PPE being issued and a register shall be kept recording the issue.

14.7.10.5 A suitable dry, clean and well-ventilated area shall be provided for the storage of the PPE.

14.7.11 Tunnel and underground work

14.7.11.1 The Contractor shall establish and implement a tagging system, which shall clearly and accurately record the number of persons entering and leaving the tunnel, their name, Company and ID card no.

14.7.11.2 All work associated with tunnels shall be performed in accordance with BS6164

14.7.11.3 The Contractor shall ensure that there is sufficient clean airflow, to the requirements of BS6164, at all times.

14.7.11.4 Before entry into such areas, remote atmosphere monitoring shall be carried out to ensure that adequate ventilation and a breathable atmosphere exist .

14.7.11.5 No person shall enter such areas unaccompanied and without adequate ventilation being in operation.

14.7.11.6 All diesel-driven plant used underground shall be provided with efficient and properly maintained catalytic converters.

14.7.11.7 Petrol driven plant or machinery shall not be used in any underground working.

14.7.11.8 No person under the age of 18 years shall enter or work in the tunnels or confined spaces. Hot work will only be carried out under the control of a Hot Work Permit

14.7.11.9 Paint, thinners or flammable gasses shall not be stored in the tunnels or in confined spaces.

14.7.12 Ladders, temporary access

14.7.12.1 The Contractor shall provide, register, maintain and use only ladders, which are purchased as proprietary products, on the Site. Site made ladders are not to be used under any circumstances.

14.7.12.2 All ladders shall be free from patent defects, secured against movement and installed in accordance with the relevant Codes of Practice.

14.7.12.3 Wooden access steps with handrails are to be installed and maintained as access where the use of mobile access staircases are impractical.

14.7.13 Temporary Works

14.7.13.1 The Contractor shall appoint an engineer as a Temporary Works Co-ordinator. His duties shall include, but not limited to, checking and certifying the design of all Temporary Works prior to erection and loading, ensuring that the erection work is carried out in accordance with the design, compiling a Temporary Works register, completing a suitably designed form or certificate which is to be displayed on the Temporary Works to say it has been inspected and is safe to load.

14.7.13.2 The Temporary Works Co-ordinator shall not be the same person who designed the Temporary Works.

14.7.13.3 Suspended, cantilever, bracket type scaffolding or working platforms are to be designed, certified and inspected by an independent engineer, who may be the Temporary Works Co-ordinator, prior to loading.

14.7.14 Temporary buildings, sheds, workshops, etc.

14.7.14.1 No temporary structure is to be erected without the consent of the Engineer.

14.7.14.2 Except where consent is obtained from the Engineer, no person shall reside on the Site.

14.7.15 Temporary electricity

14.7.15.1 Temporary electricity supplies shall comply with Chapter 18 below.

14.7.15.2 Switchbox/distribution box construction shall be robust, corrosion proof, water proof and be of coated metal and shall be mounted on an integral frame at least 1000mm off the ground. In coming cables shall be secured by a waterproof gland.

14.7.16 Housekeeping

14.7.16.1 The Contractor shall clean the Site area on a daily basis and maintain it in a safe, tidy and sanitary condition.

14.7.16.2 Sufficient waste bins are to be provided throughout the area of work and a daily disposal regime is to be established and implemented.

14.7.16.3 The Contractor is responsible for enforcing the standards of housekeeping of its sub-contractors and their areas of work.

14.7.17 Site services

14.7.17.1 The Contractor shall provide, maintain and ensure the installation to the required standards, of all services entering and being used on Site.

14.7.17.2 All Government and utility company regulations and requirements shall be complied with.

14.7.17.3 The Engineer may require the immediate termination or alteration to an installation if he considers that they are prejudicial to safety or health.

14.7.17.4 The Contractor shall ensure that services used on the Site are designed so that there is no possibility of the users of such services surrounding the Site, being affected by loss of supply, contamination, power surges, etc.

14.7.18 Contractors Equipment

14.7.18.1 the contractor shall produce policy and procedures for ensuring that all his plant and equipment used on the works site is maintained in a safe condition and is operated in a safe manner.

* End of Chapter *

CHAPTER 15

15. DAMAGE AND INTERFERENCE

15.1 Damage and Interference

15.1.1 Work shall be carried out in such a manner that, as far as is practicable, there is no damage to or interference with the following, other than such damage as is necessitated to enable the execution of the Works:

(1) watercourses or drainage systems;

(2) utilities;

(3) structures, roads including street furniture, or other property;

(4) public or private vehicular or pedestrian accesses;

(5) trees, graves or burial urns; and

(6) existing railways and railway systems.

The Contractor shall obtain prior approval of the concerned authority or party, if so required, for any work near properties under their ownership or management.

The Contractor shall inform the Engineer as soon as practicable of any item, utility or thing which is not stated in the Contract as requiring diversion, removal or relocation but which the Contractor considers as requiring diversion, removal or relocation to enable the Works to be executed. The Contractor shall not divert, remove or relocate any such item, utility or thing without such diversion, removal or relocation having been reviewed without objection by the Engineer.

15.1.2 Items which are damaged or interfered with as a result of the Works being carried out and items which are diverted, removed or relocated to enable the Works to be carried out, shall be reinstated to the same condition as existed before the Works started or to such condition as may be reviewed without objection or instructed by the Engineer.

15.1.3 The Contractor shall excavate by hand where damage may be caused by the operation of mechanical plant adjacent to any utilities.

15.1.4 Except with the prior approval of the Jaipur Fire Services, no damage or interference with existing fire hydrants and valves shall be caused.

15.1.5 Prior to trench excavation, the Contractor shall carry out investigations to locate utilities by means of hand-dug inspection pits. The locations and number of inspection pits required in meeting the Contractor's obligations to establish the location of existing utilities and underground features shall be determined by the Contractor. The Contractor shall note that many existing pipes/ducts/cables may not be shown in the records kept by the utility undertakings, and may only be exposed as the excavation proceeds. The trench excavation shall be carried out by hand where there are utilities

adjacent to or within the excavation works and the Contractor shall have allowed in his programme the time required for the exposing, temporary support and diversion of these recorded or unrecorded utilities. Should any pipes/ducts/cables or cover tiles be

15.1.6 exposed, the respective utility undertaking shall be contacted to determine if all the utilities have been located. Cover tiles and utilities shall only be removed by the utility undertakings concerned.

15.1.7 Where the Engineer has conducted utility and ground investigation on behalf of the Employer, the Contractor may obtain the data obtained from the investigations from the Engineer in accordance with clause 1.7.2 above and subject to the condition of clause 15.3 below.

15.2 Watercourses and Drainage Systems

15.2.1 Existing watercourses and drainage systems shall be temporarily diverted as required to enable the Works to be carried out. Particulars of the proposed diversions shall be submitted to the Engineer for review at least 14 days before the relevant work starts. Diversions shall be constructed to the satisfaction of the Engineer with such alignment and in such manner that the flow is discharged adequately and effectively without causing flooding or erosion to the adjacent area. The diversions shall be maintained while the work is being carried out and shall be reinstated, including the removal of any obstructions to flow, as soon as practicable after the work is complete.

15.2.2 Measures shall be taken to prevent excavated material, silt or debris from being deposited in existing drainage systems, watercourses or the river.

15.2.3 Under no circumstances shall foul sewage flow be diverted into existing storm-water drains and vice versa.

15.2.4 The Contractor shall adequately maintain the existing drainage and sewerage systems at all times including removal of solids in sand traps, manholes, gullies and streambeds.

15.2.5 The Contractor shall discharge water surface run-off from the Site into storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels or sandbag barriers shall be provided on Site to properly direct the storm water to such silt removal facilities. The Contractor shall remove all silt, which may have accumulated in the drainage or sewerage systems whether within the Site, or not. If at any time such provisions prove to be ineffective, the Contractor shall take such additional measures as the Engineer deems necessary.

15.2.6 Water pumped out of the trenches under construction shall be discharged into storm drains after the removal of silt in silt removal facilities.

15.2.7 The Contractor shall maintain the silt removal facilities, channels and manholes and remove the deposited silt and grit regularly, at the onset and after each rainstorm to ensure that these facilities are functioning properly at all times.

15.2.8 No obstruction to flow is to be left in position longer than is necessary for carrying out the Works. The Contractor shall ensure that adequate provisions are made for dealing with increased flow of water during the wet season.

15.2.9 The Contractor shall keep interruption or disturbance to the public due to the diversion works to a minimum.

15.2.10 If any mechanical equipment is required for the foul sewage diversion work, the Contractor shall suggest and provide precautionary measures to mitigate against consequences of break down of the equipment.

15.2.11 The Contractor shall at all times ensure that all existing stream courses and drains within and adjacent to the Site are kept safe and free from any debris and any excavated materials arising from the Works. The Contractor shall ensure that chemicals and concrete agitator washings are not deposited in watercourses.

15.2.12 The Contractor shall be responsible for the Temporary Works involved in training, diverting, or conducting of open streams or drains intercepted by the Works and the Site, for the maintenance of the Temporary Works and waterways as required by the Engineer, and for reinstating these to their original courses on Employer's Taking Over of the Works, when and where in the opinion of the Engineer such action is desirable.

15.2.13 The Contractor shall take all necessary precautions to prevent water entering upon or being discharged from the Site, from entering upon the works of adjacent contractors or adjacent properties.

15.2.14 The Contractor shall provide where necessary temporary water courses, floodwalls, flood gates, ditches, drains, pumping or other means of maintaining the Works and the Site free of water.

15.3 Utilities

15.3.1 The details of existing utilities are given by the employer for information only and the accuracy of the details is not guaranteed. The Contractor shall make his own enquiries and shall carefully excavate trial holes to locate accurately the utilities indicated to him by the utility undertakings.

15.3.2 Temporary supports and protection to utilities shall be provided by methods reviewed without objection by the Engineer. Permanent supports and protection shall be provided if instructed by the Engineer.

15.3.3 The Contractor shall inform the Engineer and the utility undertakings without delay of the following:

(1) damage to utilities;

(2) leakage of utilities;

(3) discovery of utilities not shown on any drawings; and

(4) diversion, removal, repositioning or re-erection of utilities which is required to enable the execution of the Works.

15.3.4 The Contractor shall take all steps necessary to enable the utility undertakings to proceed in accordance with the programme agreed between the Contractor and the utility undertakings under clause 2.2.2 above. The Contractor shall maintain close liaison with the utility undertakings and shall inform the Engineer of any delays in works by the utility undertakings.

15.3.5 The Contractor shall keep records of existing utilities encountered on the Site and a copy provided for the Engineer. The records shall be submitted for review by the Engineer and shall contain the following details:

(1) location of utility;

(2) date on which utility was encountered;

(3) nature and size of utility;

(4) condition of utility; and

(5) temporary or permanent supports provided.

15.3.6 The Contractor shall co-ordinate the activities of the utility undertakings in connection with the diversion of utility services necessary for the execution of the Works.

15.3.7 The Contractor shall set up and manage a Utilities Liaison Group for the duration of the Contract. The Group shall meet at a frequency to be as instructed by the Engineer but at least once a month, and shall discuss and resolve matters associated with utility undertakings on programming, co-ordination and action. The Contractor shall ensure that all relevant utility undertakings and the Engineer are represented at the meetings.

15.3.8 The Contractor shall inform the Engineer of the date, time and place of every meeting with utility undertakings and he shall copy all correspondence and minutes of meetings to the Engineer.

15.3.9 The programme for any section of work to be carried out by a utility undertaking shall be confirmed in writing by the Contractor to the utility undertaking no more than four weeks and no less than one week before the agreed scheduled start date for that section of Works, such confirmation to be notified to the Engineer.

15.3.10 The Contractor shall monitor the progress of utility undertakings against the agreed programmes and shall notify the Engineer of any slippage to these programmes. The agreed programmes shall mean those programmes agreed in writing by the Contractor and the various utility undertakings described in 15.3.9 above.

15.3.11 In the event of any such slippage, the Contractor shall prepare and execute a plan of action with the relevant utility undertaking to redress the slippage. Such a plan may, if necessary, include provision of Contractor's labour resources, materials and/or plant to the utility undertaking.

15.3.12 The Contractor shall ensure that the peak particle velocity and amplitude of ground movement due to temporary sheet pile driving for trench excavation or any other construction activities, as measured by a vibrograph at all water mains within or adjacent to the Site shall not exceed the values specified in this GS.

Type of structure or installation	Peak particle velocity (mm/s)	Vibration amplitude (mm)
Water retaining structures Water tunnels	13	0.1
Water mains Other structures and pipes	25	0.2

15.3.13 Hand digging method shall always be employed where there are utilities adjacent to or within the trench excavation works. Portable mechanical tools may be used but shall be restricted to the breaking of the pavement surface. Due care shall be exercised to prevent damage to the underground cables, water pipes, gas pipes or other utility installations.

15.3.14 Exposed utility installations shall be adequately supported and protected from accidental damage.

15.3.15 Smoking and use of naked flames shall be prohibited if gas pipes are present, or pipes the use of which are not identified are present.

15.4 Structures, Roads and Other Property

15.4.1 The Contractor shall immediately inform the Engineer of any damage to structures, roads or other property that is not required for the execution of the Works.

15.4.2 The Contractor shall use every reasonable means to prevent any of the highways or bridges connecting with, or on the routes to, the Site from being damaged by any traffic of the Contractor or any of his sub-contractors of any tier and the Contractor shall, in particular, select routes, choose and use vehicles and restrict and distribute loads so that the moving of Temporary Works, Permanent Works and Contractor's Equipment from and to the Site shall be organised as far as reasonably possible so that no unnecessary damage or injury may be occasioned to such highways and bridges. The Contractor shall in selecting such routes take advice from and follow the instructions of the Commissioner for Transport and other Relevant Authorities of Govt. of Rajasthan and GOI.

15.4.3 Should the Commissioner for Transport or any other Relevant Authority or the Contractor be of the opinion that it should be necessary to move one or more loads of Temporary Works, Permanent Works or Contractor's Equipment over a highway or bridge the moving of which is likely to damage any highway or bridge unless special protection or strengthening is carried out then the Contractor shall, before moving the load on to such highway or bridge, give notice to the Engineer of the weight and other particulars of the load to be moved and request the protection or strengthening of the said highway or bridge. If within 14 (fourteen) days of receipt of such notice the Engineer directs in writing that such protection or strengthening is unnecessary then the Contractor may move the said load or loads over the said highway or bridge but otherwise the Contractor shall not move the said load or loads until notified by the Engineer of the route which he may use.

15.4.4 If during the execution of the Works or at any time thereafter the Contractor shall receive any claim arising out of the execution of the Works in respect of damage or injury to highways or bridges he shall immediately report the same to the Engineer and thereafter the Employer shall negotiate the settlement of and pay all sums due in respect of each claim and shall indemnify the Contractor in respect thereof and in respect of all claims,

demands, proceedings, damages, costs, charges and expenses whatsoever in relation thereto. Provided always that if and so far any such claim or part thereof shall in the opinion of the Engineer be due to any failure on the part of the Contractor to observe and perform his obligations under clauses 15.4.2 above and 15.4.3 above, the amount certified by the Engineer to be due to such failure shall be paid by the Contractor to the Employer

15.4.5 Where the nature of the Works is such as to require the use by the Contractor of water-borne transport, the foregoing provisions of this Clause shall be construed as though "highway" includes any river or other structure related to, on or beneath a waterway, and "vehicle" includes craft, vessels or platforms and shall be read and construed accordingly.

15.4.6 If in the course of or for the purposes of the execution of the Works or any part thereof any highway or road or way shall have been damaged, broken or broken into then notwithstanding anything herein contained:

(a) If the permanent reinstatement of such highway or road or way is to be carried out by the appropriate Relevant Authority or by some person other than the Contractor or any sub-contractor of any tier to him, the Contractor shall:

(i) at his own cost and independently of any requirement of or notice from the Engineer be responsible for the temporary reinstatement of such highway, road or way and the making good of any subsidence or shrinkage or other defect, imperfection, settlement or fault in the temporary reinstatement of such highway, road or way and for the execution of any necessary repair or amendment thereof from whatever cause the necessity arises until the end of the Defects Liability Period in respect of the part of the Permanent Works beneath or over such highway, road or way or until the Relevant Authority or such other person as aforesaid shall have taken possession of the highway, road or way for the purpose of carrying out permanent reinstatement, whichever is the earlier; and

(ii) indemnify and save harmless the Employer against and from any damage or injury to the Employer or claims by third parties arising out of or in consequence of any neglect or failure of the Contractor to comply with the foregoing obligations or any of them, and against and from all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto; and

(b) as from the end of such Defects Liability Period or the taking of possession of such highway, road or way referred to in clause 15.4.6(a)(i) above whichever shall first happen, the Employer shall indemnify and save harmless the Contractor against and from any damage or injury to the Contractor arising out of or in consequence of or in connection with the said permanent reinstatement or any defect, imperfection or failure of or in such permanent reinstatement and against and from all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

15.4.7 Where the Relevant Authority or other person referred to in clause 15.4.6 above shall take possession of the highway, road or way as aforesaid in

sections or lengths, the responsibility of the Contractor under clause 15.4.6 above shall cease in regard to any such section or length at the time at which possession thereof is so taken. But shall during the continuance of the said Defects Liability Period continue to be responsible for any section or length of which possession has not been taken and the indemnities given by the Contractor and Employer respectively under clause 15.4.6 above shall be construed and have effect accordingly.

15.5 Access

Alternative access shall be provided if interference with existing public or private vehicular or pedestrian access is necessary to enable the execution of the Works. The arrangements for the alternative access shall be as reviewed without objection by the Engineer. The permanent access shall be reinstated as soon as practicable after the work is complete and the alternative access shall be removed as soon as practicable after it is no longer required.

15.6 Trees and Other Similar Obstructions

15.6.1 Trees which are to be retained or which are not required to be removed in order to carry out the Works, shall be protected from damage at all times by methods reviewed without objection by the Engineer. Materials, including excavated materials, shall not be banked around such trees and they shall not be trimmed or cut without having been reviewed without objection by the Engineer.

15.6.2 If any trees or other obstructions are required to be removed during the execution of the Works which are not specifically required to be removed or otherwise catered for, the Contractor shall draw the attention of the Engineer to them and shall not remove them without having received a notice of no objection from the Engineer.

15.7 Noise Control on Works Site

15.7.1 All Contractor's Equipment shall be effectively "sound-reduced" by means of silencers, mufflers, acoustics linings or shields or acoustic sheds or screens to levels prescribed in the relevant Noise Control Ordinance and measured outside the nearest occupied property or to the satisfaction of the Engineer. The Contractor shall provide details of proposed noise control measures to the Engineer for review prior to the use of any Contractor's Equipment on the Site.

15.7.2 Provided that the provisions of this Paragraph shall not be applicable in the case of emergency work necessary to save life or property or for the safety of the Works or in the case of blasting operations necessitated by urgency and reviewed by the Engineer.

15.7.3 The Contractor shall provide a sound level meter (as specified in Appendix of this Specification), reviewed without objection by the Engineer, for the exclusive use of the Engineer at all times during the continuance of the Contract.

15.8 Spoil Disposal

15.8.1 The Contractor shall make his own enquiries and arrangements regarding the location and the availability of spoil disposal areas and reclamation and shall pay all costs of complying with all regulations and requirements of Relevant Authorities in connection with the use of such areas. These areas are not within the control of the Employer and no claims will be entertained in respect of non-availability of a particular areas or changes in the costs of arrangements for the use thereof.

15.8.2 The Contractor shall be responsible for all necessary liaison to ensure compliance with the requirements of unproductive disposal of any surplus excavated rock or soft material which is suitable for filling

15.8.3 The Contractor shall conform to all pertinent Environmental Protection Ordinances and be liable for any breach of such Ordinances committed by himself and/or his sub-contractors during the disposal of surplus excavated material and water from the Site.

* End of Chapter *

CHAPTER 16

16. ENVIRONMENTAL PROTECTION REQUIREMENTS

16.1 GENERAL

16.1.1 The Contractor shall conform to the Indian Environmental Laws and codes as applicable. The current national standards established by the Ministry of Environment and Forest, Government of India and other government agencies for control of environmental pollutants such as air, water, noise and visual impacts/aesthetics shall be followed for compliance during project construction.

16.1.2 The Contractor shall comply with all enactments and their amendments, which shall include but are not limited to:

1. Environment Protection Act,1986
2. Air (Prevention and control of Pollution) Act,1981
3. Water (Prevention and Control of Pollution) Act,1974
4. Notification on Control of noise from DG sets,2002
5. The Noise pollution (Regulation & Control) rules, 2000
6. The Hazardous Waste (Management & handling) Rules, 1989
7. Manufacture, storage and Import of hazardous chemicals Rules, 1989
8. Regulation on Recycling of Waste Hazardous Materials
9. Batteries (Management & Handling) Rules, 2001

16.1.3 The provisions listed herein regarding Environmental Protection shall apply to and be binding upon the Contractor for any works on the site and the persons employed by sub-Contractors. The Contractor shall ensure that proper and adequate provisions to this end are included in all sub-contracts placed by him.

16.1.4 The provisions of this Appendix however, shall not be applicable in the case of emergency works necessary for saving of life and property or safety of the Works.

16.1.5 The Contractor has been issued with the Employer's Environmental Quality Management Manual. Within 20 weeks of notification of acceptance of the Tender, the Contractor shall submit for review by the Employer's Representative, a draft of his own contract specific Site Environmental Plan based on the environmental protection requirements contained in this chapter and on the Employer's Environmental Quality Management Manual and his construction methodology. He shall submit a final version prior to the commencement of the works.

16.1.6 This contract specific Site Environmental Plan of the Contractor, as referred to in Chapter 3 above, shall be consistent with the provisions of the Environmental Management Plan outline, as given in the Employer's Environmental Quality Management Manual.

16.1.7 On account payment to be made after three months of issuance of Letter of Acceptance, shall be released, if site environmental plan has been submitted by the contractor and approved by Employer's Representative. Otherwise Rs.1,50,000 (Rupees one lac fifty thousand as lump sum amount shall be with held from running bill till compliance of the above.

16.1.8 The Contractor shall ensure that audits of all the activities detailed in his Site Environmental Plan are carried out at weekly intervals or at such intervals as the Employer's Representative may require to ensure the continuing effectiveness and compliance with the Site Environmental Plan. The Contractor shall make available on request any document, which relates to his recent internal audits.

16.1.9 For closure of Non Conformance Report, expeditious action shall be taken by the contractor for compliance and the contractor shall ensure closure of non-conformance report within 15 days of its issue. In case of non-closure of report, an amount of Rs.20, 000/- (Rupees Twenty thousand only) shall be with held from running on account bill for every non-closure of report till the same is closed satisfactorily.

16.1.10 The Employer's Representative may conduct quarterly Audits of the Contractor's Site Environmental Plan and its effective implementation on the works site. One-week notice will be given by the Employer's Representative before proceeding with the audit. During the audit by the Employer's Representative, the Contractor shall provide suitably qualified staff to accompany the auditor.

16.1.11 Milestone payments will be achieved for successful quarterly audits for which the Employer's Representative has issued a "Notice of No Objection" or a "Notice of No Objection subject to…."

16.1.12 The contractor shall carry out its own Environmental Audits after four months of issuance of Letter of Acceptance and every three months thereafter. Submission of Environmental Audit Report duly reviewed and accepted by Employer's Representative along with action taken shall be ensured within one month of due date of such audits. Otherwise a lump sum amount of Rs. 1.00 lac (Rupees one lac) shall be recovered for each failure from running bill and this shall not be refunded.

16.2 HOUSEKEEPING

16.2.1 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.

16.2.2 Following site clearing and before construction of its contracted activities, the Contractor shall remove all trash and debris.

16.2.3 The Contractor shall ensure that the work place is as far as practicable, maintained in a neat and tidy manner. The materials for use and tools and tackles shall be stacked and stored in a manner that is safe and does not cause obstruction to movement of men and machines at site.

16.2.4 The Contractor shall maintain the worksite free of trash, garbage and debris. He shall provide and ensure proper uses of refuse containers to ensure that rodents, flee and other pests are not harbored and attracted.

16.2.5 These may be 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. The refuse containers shall be kept upright with their lids shut tight. These containers shall be emptied at-least once daily by the Contractor to maintain site sanitation.

16.2.6 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 described in (5) above. Suitable notice shall be deployed prominently for strict compliance of these requirements.

16.2.7 Separate containers shall be used for non-biodegradable and reusable/recyclable wastes and properly labelled.

16.2.8 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

(a) 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;

(b) still waters shall be treated at least once every week with oil in order to prevent mosquito breading;

(c) 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) Water storage tanks shall be suitably provided.

(e) Posters in both Hindi and English, which draw attention to the dangers of permitting mosquito breeding, shall be displayed prominently on the Site.

16.3. AIR QUALITY

16.3.1 The Contractor shall take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer's Representative.

16.3.2 The Contractor shall use construction equipment designed and equipped to minimise or control air pollution. He shall maintain evidence of such design and equipment and make these available for inspection by Employer's Representative.

16.3.3 If after commencement of construction activity, Employer's Representative believes that the Contractor's equipment or methods of working are causing unacceptable air pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer's Representative and implemented.

16.3.4 In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to air pollution. Remedial measures include use of additional/ alternative equipment by the Contractor or maintenance/modification of existing equipment of the Contractor.

16.3.5 Dust generating materials shall be:

(i) Transported in closed containers or covered trucks.
(ii) Loaded and unloaded in closed systems or wind protected areas.
(iii) Watered as appropriate to minimise dust production.

16.3.6 Contractor's transport vehicles and other equipment shall conform to emission standards fixed by Statutory Agencies of Government. The Contractor shall carry out periodical checks and undertake remedial measures including replacement, if required, so as to operate within permissible norms.

16.3.7 In the event that approved remedial measures are not being implemented and serious impacts persist, the Employer's Representative may direct the Contractor to suspend work until the measures are implemented, as required under the Contract.

16.3.8 The Contractor shall cover loads of materials, debris and soil transported from construction sites. All trucks carrying loose material should be covered and loaded with sufficient free- board to avoid spills through the tailboard or sideboards.

16.3.9 The Contractor shall be responsible for ensuring that no earth, rock or debris is deposited on public or private right of way as a result of his operations, including any deposits arising from the movement of loaded/unloaded trucks and/or other construction vehicles. In the event of it happening, the contractor shall clean the public/private right of way to the satisfaction of Employer's Representative.

16.3.10 The Contractor shall make his own arrangements for water for purposes stated in above clauses and wherever it may be required to control air pollution, dust and debris.

16.3.11 The Contractor shall establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used on this project. He shall keep records available for inspection by Employer's Representative.

16.3.12 The Contractor shall promptly transport all excavation disposal materials of whatever kind so as not to delay work on the project. Stockpiling of materials will only be allowed at sites designated by the Employer's Representative.

16.3.13 The Contractor shall protect structures, utilities, pavements, public and private right of way and other facilities from disfiguration and damage due to contractor's activities including movement of construction equipment and machinery. Should this happen, he shall make good the damage and remedy the situation to the satisfaction of the Employer's Representative.

16.3.14 The Contractor shall place excavation materials in the dumping/disposal areas designated in the plans as given in the specifications.

16.3.15 The temporary dumping areas shall be maintained by the Contractor at all times until the excavate is re-utilised for backfilling or as directed by Employer's Representative.

16.3.16 The Contractor shall place material in a manner that will minimise dust production. Material shall be stabilised each day and wetted, to minimise dust production.

16.3.17 During dry weather, dust control methods must be used daily especially on windy, dry days to prevent any dust from blowing across the site perimeter.

16.3.18 The Contractor will make water sprinklers, water supply and water delivering equipment available at any time that it is required for dust control use.

16.3.19 Dust control activities shall continue even during any work stoppage.

16.3.20 At each construction site, the Contractor shall provide storage facilities for dust generating materials and shall be:

(i) Closed containers/bins or;
(ii) Wind protected shelters or;
(iii) Mat covering or;
(iv) Walled.

Or any combination of the above to the satisfaction of the Employer's Representative.

16.3.21 The Contractor shall submit to the Employer's Representative an Air Monitoring and Control Plan (AMCP) under contract specific Site Environmental Plan to guide construction activity at work sites insofar as it relates to monitoring, controlling and mitigating air pollution. Air monitoring devices used for such monitoring shall be inspected, calibrated, maintained and used in accordance with the manufacturer's instructions.

16.3.22 For the above tunnel works, Suspended Particulate Matter (SPM) shall be monitored, at three locations for two 24-hour samples, every fifteen days. Number of locations can be increased or decreased by the Employer's Representative depending on the extent of construction activity and its proximity to air sensitive receptors. Permissible values for SPM shall be the recorded base line values or national standards, which ever is higher.

16.3.23 For its activities within the confined spaces, the contractor shall monitor flammable gases, oxygen, carbon monoxide, carbon dioxide, hydrogen sulphide, oxides of nitrogen, and aldehyde. The contractor shall also monitor for any other poisonous gas that the Employer's Representative shall deem appropriate and necessary.

16.3.24.1 Air monitoring in confined spaces shall be carried out as often as necessary, however, the duration between two sets of readings shall not be more than 4 hours.

16.3.25 Within the confined spaces, air shall be considered unfit for workmen to breathe if it contains any of the following:

(i) Less than 19.5% and more than 22% oxygen by volume.
(ii) More than 0.5% carbon dioxide by volume.
(iii) More than 0.01% carbon monoxide by volume.
(iv) More than 0.001% hydrogen sulphide by volume.
(v) More than 0.003% oxides of nitrogen.
(vi) More than 0.5% of methane at any place in the tunnel.
(vii) More than 0.0005% of aldehyde.

Any other poisonous gas in harmful amounts.

16.3.26 A record of all air quality monitoring containing location, date, time, substance, monitoring results and name of person conducting the tests shall be maintained by the contractor and made available for inspection by the Employer's Representative.

16.4 WATER QUALITY

16.4.1 The Contractor shall comply with the Indian Government legislation and other State regulations in existence in Jaipur insofar as they relate to water pollution control and monitoring.

16.4.2 The Contractor shall provide adequate precautions to ensure that no spoil or debris of any kind is pushed, washed, falls or deposited on land adjacent to the site perimeter.

16.4.3 In the event of any spoil or debris from construction works being deposited on adjacent land any silt washed down to any area, then all such spoil, 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's Representative.

16.4.4 Due to lowering of potable water supplies in Jaipur and subsequent contamination of ground water, the Contractor is not allowed to discharge water from the site without the approval of the Employer's Representative. 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 and this water may subsequently be discharged to the drainage system or, if not re-used, recharged to the ground water at suitable acquifer levels. The Contractor must submit his proposals for approval of Employer's Representative, on his proposed locations of dewatering of excavation and collection of water for either construction re-use or recharge directly to acquifers. The Contractor's recharge proposals must be sufficient for recharging of the quantity of water remaining after deduction of water re-used for construction.

16.4.5 The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to the site are kept safe and free from any debris and any excavated materials arising from the Works. The Contractor shall ensure that earth, bentonite, chemicals, any mud slurry from drilling or grouting and concrete agitator washings etc. are not deposited in the watercourses and not discharged into the drainage system unless treatment is carried out that will remove silt, mud particles, bentonite etc. but are suitably treated and effluents and residue disposed off in a manner approved by local authorities.

16.4.6 All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that will cause neither pollution nor nuisance.

16.4.7 The Contractor shall discharge wastewater arising out of site office, canteen or toilet facilities constructed by him into sewers after obtaining prior approval of agency controlling the system. A wastewater drainage system shall be provided to drain wastewater into the sewerage system.

16.4.8 The Contractor shall take measures to prevent discharge of oil and grease during spillage from reaching drainage system or any water body. Drips pans, placed on hard surface shall be used to store oil/grease drums.

16.5 NOISE

16.5.1 General

(1) The Contractor shall consider noise as an environmental constraint in his design, planning and execution of the Works. 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.

(2) 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.

(3) The Contractor shall ensure that, as far as ambient noise is concerned, noise generated by work carried out by the Contractor and his sub-Contractors during day time and night time shall not exceed the background noise levels by 10dB(A) or more when measured at a point outside the premises of the location of the source. When background noise levels are not available, the permissible noise levels shall meet the requirements as given in the Environmental Quality Management Manual. The same may be varied from time to time by and at the sole discretion of the Employer's Representative. 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.

(4) For ambient noise level compliance, number of monitoring locations shall be atleast four. Number of locations can be increased or decreased by the Employer's Representative depending on the extent of construction activity and its proximity to noise sensitive receptors. The other noise monitoring requirements shall be as given in the Employer's Environment Quality Management Manual.

(5) For noise emanating from generators run with diesel, notification dated 17th May 2002 under Environmental (Protection) Act,1986 shall apply which require acoustic treatment or acoustic enclosure such that insertion loss of 25dB(A) is obtained or ambient noise standards are met, which ever is on the higher side.

16.5.2 Protection against the effects of occupational noise exposure shall be provided when the sound levels exceed those shown in Table of this section when measured on the A-scale of a standard sound level meter at slow response.

16.5.3 When employees are subjected to sound levels exceeding those listed in Table of this section, feasible administrative or engineering controls shall be utilized. 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.

TABLE

Permissible Noise Exposures

Duration per Day, Hours	**Sound Level (Slow Response)**
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

16.5.4 If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous. In all cases where the sound levels exceed the values shown herein, a continuing, effective hearing conservation program shall be administered.

16.5.5 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 as given below

$F_e = (T_1 / L_1) + (T_2 / L_2) + ... + (T_n / L_n)$ where:

Fe = The equivalent noise exposure factor.
T = The period of noise exposure at any essentially constant level.
L = The duration of the permissible noise exposure at the constant level (from Table).

If the value of F_e exceeds unity (1) the exposure exceeds permissible levels.

16.5.6 A sample computation showing an application of the above formula is as follows. An employee is exposed at these levels for these periods:

110 db A 1/4 hour.
100 db A 1/2 hour.
90 db A 1 1/2 hours.

Then, Fe = (1/4/1/2) + (1/2/2) + (1 1/2/8)
Fe = 0.500 + 0.25 + 0.188
Fe = 0.938

Since the value of Fe does not exceed unity, the exposure is within permissible limits.

16.5.7 Construction material should be handled and transported in such a manner as not to create unnecessary noise as outlined below.

16.5.8 Under the Contract, the Contractor shall:

(1) 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.

(2) 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.

(3) 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.

(4) The Contractor shall submit to the Employer's Representative 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 nighttime, and of his proposed working methods and noise level reduction measures. The NMCP shall include detailed noise calculations to demonstrate the anticipated noise generation by the Contractor.

(5) 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 shall appear as a regular agenda item in project coordination meetings.

16.5.9 Vibration Level Limits

The vibration level limits at historical sites adjacent to the alignment shall conform to revised version of the German Standard (DIN 4150). The scheme for monitoring vibration level at these historical sites shall be submitted to Employer's Representative for his approval. The scheme shall include:

(1) monitoring requirements for vibrations at regular intervals throughout the construction period.

(2) pre-construction structural integrity inspections of historic and sensitive structures in project activity.

(3) Information dissemination about the construction method, probable

(4) effects, quality control measures and precautions to be used.

16.6 WASTE

16.6.1 The Contractor shall handle waste in a manner that ensures they are held securely without loss or leakage thus minimising potential for pollution.

16.6.2 The Contractor shall remove waste in a timely manner. Scrap and waste material shall be removed and disposed off at landfill sites after obtaining approval of local Govt. authorities.

16.6.3 Burning of wastes is prohibited. The Contractor shall not burn debris or vegetation or construction waste on the site but remove it in accordance with (2) above.

16.6.4 The Contractor shall maintain and clean waste storage areas regularly.

16.6.5 If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989" and chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules,1989 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.

16.6.6 The contractor shall ensure that oily waste including oil soaked rags/cotton is disposed off to agency authorised to dispose such waste. The contractor shall sell discarded batteries to the authorised recycler of such items.

16.7 PREVENTION OF MOSQUITO BREEDING

16.7.1 Measures shall be taken to prevent mosquito breeding at site. The measures to be taken shall include:

(a) 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;

(b) still waters shall be treated at least once every week with oil in order to prevent mosquito breading;

(c) 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) Water storage tanks shall be suitably provided.

16.7.2 Posters in both Hindi and English which draw attention to the dangers of permitting mosquito breeding shall be displayed prominently on the Site.

* End of Chapter *

CHAPTER 17

17. PHOTOGRAPHS

17.1 Photographs

17.1.1 Colour progress photographs showing the progress of the Works and the quality of the materials and workmanship shall be taken by the Contractor. The photographs shall be taken by a professional photographer, nominated by the Contractor and reviewed without objection by the Engineer. Processing shall be carried out by a competent processing firm, nominated by the Contractor and reviewed without objection by the Engineer. The photographs shall be taken under the direction of the Employer or the Engineer at locations selected by the Employer or the Engineer. Photographs shall be taken once every month and at other times instructed by the Employer or the Engineer.

17.1.2 One proof 3R print of each progress photograph shall be provided to the Engineer not more than 2 days after the photographs are taken. The Engineer shall select the sets of progress photographs to be provided. The selected sets shall be provided not more than 2 days after the Engineer has selected the sets. The following shall be provided for the Engineer:

(1) one set of each selected progress photograph comprising the negatives/soft copy and three 3R prints;

(2) albums for the photographs and negatives/soft copy; and

(3) printed labels for each photograph.

17.1.3 The Contractor shall provide to the Engineer the photographs selected in clause 17.1.2 above on Photo Compact Disks with a minimum resolution of 64 Base (4096 x 6144).

17.1.4 The Contractor may propose to the Engineer the use of a digital photography system by handing over a digital camera to the engineer for such purposes to meet the requirements of this Chapter. The Engineer shall at his discretion, review the proposed system for practical and technical compliance.

17.1.5 Colour progress photographs shall provide a fair representation of the Works. A minimum of 24 photographs per month shall be submitted to the Engineer.

* End of Chapter *

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CHAPTER 18

18 TEMPORARY WATER AND ELECTRICITY SUPPLY

18.1 **Deleted**

18.2 Applicability

18.2.1 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 clauses 18.3 to 18.18 inclusive.

18.2.2 When the Contractor makes use of temporary electrical supplies provided by other, he will observe and comply with the requirements of this Chapter.

18.3 Work on Site

18.3.1 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 the safety of all temporary electrical equipment on Site. The Contractor shall not install or operate any temporary Site electrical systems until this representative is appointed and has commenced duties.

18.3.2 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.

18.3.3 The Contractor shall submit schematic diagrams and the details of the equipment for all temporary electrical installations, and these diagrams together with the temporary electrical equipment shall be submitted to the Engineer for review.

18.3.4 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 categorised electricians, who are registered as such under the Electricity Ordinance 1990/Electricity (Registration) Regulations 1990.

18.4 Electrical General

Temporary electrical Site installations and distribution systems shall be in accordance with:-

(1) Indian Electrical Regulations;

(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 Tunnelling in the Construction Industry.

(8) Any other applicable national standards

18.4.1 Materials, Appliances and Components

All materials, appliances and components used within the distribution system shall comply with BS 4363 and BS 7375 Appendix A.

18.4.2 Design Considerations

18.4.2.1 Distribution equipment utilised within the temporary electrical distribution system shall incorporate the following features:-

(1) flexibility in application for repeated use;

(2) suitability for transport and storage;

(3) robust construction to resist moisture and damage; and

(4) safety in use.

18.4.2.2 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.

18.4.2.3 The installation on Site shall allow convenient access to authorised and competent operatives to work on the apparatus contained within.

18.5 Mains Voltage

18.5.1 The Site mains voltage shall be as the Electricity Companies' Utility supplies, 415V 3-phase 4 wire system.

18.5.2 Single-phase voltage shall be as the Electricity Companies' Utility supplies, 230V supply.

18.5.3 Reduced voltages shall conform to BS 7375.

18.6 Types of Distribution Supply

18.6.1 The following voltages shall be adhered to for typical applications throughout the distribution systems:

(1) fixed plant - 415V 3 phase;

(2) movable plant fed by trailing cable - 415V 3 phase;

(3) installations in Site buildings - 230V 1 phase;

(4) fixed flood lighting - 230V 1 phase;

(5) portable and hand held tools - 115V 1 phase;

(6) Site lighting (other than flood lighting) - 115V 1 phase; and

(7) portable hand-lamps (general use) - 115V 1 phase.

18.6.2 When the low voltage supply is energised via the Employer's transformer, any power utilised from that source shall be either 415V 3 phase or / 230V single phase as appropriate. The Contractor shall carry out any conversion that may be necessary to enable him to use power from that source.

18.7 Protection of Circuits

118.7.1 Protection shall be provided for all main and sub-circuits against excess current, 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.

18.7.2 Discrimination between circuit breakers, circuit breakers and fuses shall be in accordance with:-

(1) BS 88;

(2) BS EN 60898; and

(3) BS 7375;

(4) Any other appropriate Indian Standards.

18.8 Earthing

18.8.1 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.

18.8.2 Earthing systems shall conform to the following standards:-

(1) IEE Wiring Regulations (16th Edition);

(2) BS 7430;

(3) BS 7375; and

(4) IEEE Standard 80 Guide for Safety in AC Substation Grounding.

18.9 Plugs, Socket Outlets and Couplers

Low voltage plugs, sockets and couplers shall be colour coded in accordance with BS 7375, and constructed to conform to BS EN 60309. High voltage couplers and 'T' connections shall be in accordance with BS 3905.

18.10 Cables

18.10.1 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 33KV shall be in accordance with BS 6346. The cable armouring shall be used as the earth return in conditions where the cable is continuously extended and not subject to continuous movement after installation.

18.10.2 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 standards appropriate to the duties imposed on it:

(1) BS 6708 flexible cables for use at mines and quarries;

(2) BS 6007 rubber insulated cables for electric power and lighting; and

(3) BS 6500 insulated flexible cords and cables.

18.10.3 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:-

(1) BS 6346 for armoured PVC insulated cables; and

BS 6708 Flexible cables for use at mines and quarries.18.10.4 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.

18.10.5 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.

18.10.6 For resistance to the effects of sunlight, overall non-metallic covering of cables shall be black in colour.

18.10.7 Cables which have applied to them a voltage to earth exceeding 12 V but not normally exceeding 65 V shall be either one of the type as described in clause 0 above or alternatively of a type insulated and sheathed with a general purpose or heat resisting elastomer.

18.10.8 All cables that are likely to be frequently moved in normal use shall be flexible cables.

118.10.9 Flexible cables shall be in accordance with BS 6500 and BS 7375.

18.11 Lighting Installation

18.11.1 Lighting circuits shall be run separate from other sub-circuits and shall be in accordance with BS 7375 and BS 4363.

18.11.2 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.

18.11.3 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.

18.11.4 Where the Engineer requires Site inspection of the Works, the Contractor shall upgrade the lighting level to a minimum of 200 lux by localised lighting in all areas.

18.11.5 Use of wire guards or other such devices shall provide mechanical protection of luminaries against damage by impact whenever risk of damage occurs.

18.12 Electrical Motors

18.12.1 Totally enclosed fan cooled motors to BS 4999:Part 105 shall be used.

18.12.2 Motor control and protection circuits shall be as stipulated in BS 6164. Emergency stops for machinery shall be provided.

18.13 Inspection and Testing

Electrical installations on Site shall be inspected and tested in accordance with the requirements of the IEE Wiring Regulations (16th Edition).

18.14 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.

18.15 Maintenance

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.

18.16 Maintenance Record

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.

18.17 Metering

18.17.1 For the purposes of the clause, "construction works" shall mean the Works excluding both the Contractor's on and off Site, fabrication facilities, workshops, work-yards, offices and stores.

18.7.2 The Contractor shall install a separately metered and invoiced supply or supplies of electricity for:-

(1) Site fabrication facilities;

(2) Site workshops and work-yards; and

(3) Site offices and stores.

18.18 Inability to Supply

Wherever, the Project (civil) Contractor is not in a position to supply construction power and water supply to the systemwide Contractor, he (the systemwide Contractor) shall arrange for his own separate construction power and water supply.

* End of Chapter *

CHAPTER 19

19 MOCK-UPS, PROTOTYPES AND SAMPLES

19.1 Requirements

19.1.1 The Contractor shall produce mock-ups, prototypes and samples as specified in the PS.

19.1.2 Samples may be subject to testing and investigation by the Employer and the Engineer shall in no way be incorporated into the Permanent Works.

19.1.3 Samples shall become the property of the Employer.

19.2 Purpose

19.2.1 The mock-ups, samples and prototypes shall demonstrate the proposed design and/or design options. Any mock-ups shall increase in levels of detail and finish as the design progresses.

19.2.2 Mock-ups and prototypes may generally be produced initially with "dummy" equipment items unless otherwise specified, so long as there is sufficient detail to evaluate the operability and/or maintainability aspects of the proposed layout.

19.2.3 The mock-ups and prototypes shall be constructed at the Contractor's premises unless otherwise specified in the PS.

19.3 Review

19.3.1 The Engineer will conduct a minimum of three formal reviews initially at the place of manufacture.

19.3.2 The complete and agreed mock-ups and prototypes shall be suitable for transportation to, and display in Jaipur for final review by the Engineer and the Employer.

19.3.3 The Contractor shall transport and set up such mock-ups and prototypes at a nominated site in Jaipur. After each review, the Contractor shall incorporate the Engineer's review comments into the mock-ups and prototypes prior to the next scheduled review.

* End of Chapter *

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Appendix 1

1. MONTHLY PROGRESS REPORT

1.1 Topics

1.1.1 The Monthly Progress Report required under clause 2.10 of the GS shall include as a minimum the following sections and topics:

(1) Executive Summary, highlighting any matters of concern and explaining corrective action to be taken

(2) Safety and Quality issues (including any necessary corrective action taken or proposed to prevent the re-occurrence of the non-conformities)

(3) Programme and overall progress

(4) Physical progress report (see Paragraph 2.19 of the General Specification)

(5) Manufacturing status

(6) Materials ordered / in process

(7) Equipment procured

(8) Delivery status

(9) Shipping / transportation activity

(10) Deliveries to JMRC (including release certificate reference)

(11) Free issue items (where applicable)

(12) Installation / erection on Site

(13) Site surveys (where applicable)

(14) Completion of remedial works / Site acceptance

(15) Safety audit and safety report

(16) Test and Commissioning

(17) Commissioning activity

(18) Planned vs. Actual Table

(19) Remedial works

(20) Documentation

(21) As-built drawings

(22) Training

(23) Employer's Taking Over of Works (part or whole of Works)

(24) Taking Over Certificate

(25) Defects Liability

(26) Contractual / Commercial

(27) Payments / invoices

(28) Engineer's instructions and variation orders

(29) Claims / potential claims

(30) Contractor's resources (details of all staff and sub-contractors engaged on the Works)

(31) Progress photographs

1.2 Progress Reports

The Monthly Progress Reports shall be accompanied by:

a) the Works Programme, marked to show the status of progress to date;

b) control schedules for document submissions and issues of a repetitive or multiple nature;

c) where appropriate, exception reports to highlight any problem areas including any submissions and design information which are overdue;

d) identification and discussion of significant accomplishments, problem areas encountered, actions taken or planned to resolve actual or potential problems and conflicts, and other comments or proposals on matters (including the interfacing works) affecting or likely to affect the Works; and

e) a critical items action list which identifies outstanding problems associated with the timely completion of the Works including anticipated actions for their resolution.

1.2.1 The programmes shall show current status to provide a comparison between the Works Programme and reported progress.

1.2.2 Actual progress shall be reported for each activity in the Works Programme in the following terms:

(1) the percentage of the work which is complete;
(2) the remaining duration of the work;
(3) the actual start date; and
(4) the actual completion date.

1.2.3 Actual progress shall reflect the physical scope of the work that has been completed and shall not be calculated based on elapsed time or hours worked. Any automatic statistical indications in the Contractor's software that is based on this principle shall be disabled.

1.3 Copies

1.3.1 The Contractor shall submit 1 unbound original and 9 bound hard copies of all Monthly Progress Reports and of the accompanying documents plus one copy in electronic format on PC compatible 3-1/2" diskettes compatible with Microsoft Office and Primavera P3 applications.

End of Appendix 1 *

Appendix 2

2. CONTRACT SYSTEMS SAFETY MANAGEMENT

2.1 Safety Assurance Programme

2.1.1 The Contractor shall within 30 days of Notice to Proceed, submit his proposed Safety Assurance Programme Plan for review and acceptance by the Engineer.

2.1.2 The Safety Assurance Programme Plan shall cover manufacture, testing, integrated testing, and commissioning to ensure safe routing, spacing, movement and control of trains and meet the requirements as stipulated in the PS.

2.1.3 The Safety Assurance Programme Plan shall also address reliability, maintainability and availability of the system. This shall ensure the system has a high degree of reliability and minimise down time during routine and failure repair.

2.1.4 The Safety Assurance Programme Plan shall include a Fire Control Plan which shall evaluate and ensure *inter-alia* that the fire loading of the materials proposed to be used, and potential sources of combustion in case of failure are compatible with currently accepted international practice.

2.1.5 The Safety Assurance Programme Plan shall describe procedures required to perform the specific tasks necessary to achieve safety, reliability and maintainability requirements. These procedures shall be incorporated within the Contractor's Quality Assurance System, and shall be subject to review by the Engineer

2.2 Hazard Analysis

2.2.1 The Contractor shall take the lead role in the interface Hazard Analysis for trackside equipment, to which the system is interfaced, provided by other contractors.

2.2.2 The Contractor shall produce the Hazard Analysis Schedule for the complete system including all interfacing systems and shall interface principally with the Rolling Stock, Signalling, Communication, Power Supply, Civil and Depot Contractor as well as any other Designated Contractors to obtain the information necessary, from their hazard analyses, to complete the analysis.

2.2.3 The Contractor shall, as part of the safety analysis, prepare analyses to identify Hazards and ensure their satisfactory resolution. The following analyses shall be prepared and submitted by the Contractor for the Engineer acceptance.

(i) Preliminary hazard analysis

(ii) Interface hazard analysis (excluding EMI)

(iii) Subsystem hazard analysis

(iv) Operating hazard analysis including maintenance

(v) Quantitative fault tree analysis

(vi) Failure modes effects and criticality analysis (FMECA)

2.2.4 The Hazard Analysis shall be carried out in accordance with MIL-STD-882C as the primary standard and Defence Standard 00-56, or equivalent, in areas not adequately addressed by the former standard.

2.2.5 The Contractor shall compile a list of critical and catastrophic items identified as a result of hazard analysis, FMECA or by other means.

2.2.6 All hazard resolution by procedural control shall be cross-referenced from the Critical and Catastrophic Items List to the appropriate manuals.

2.2.7 The qualitative measures of hazard severity are defined as follows:

(i) Hazard Category I – Catastrophic: Operating conditions such that personnel errors, environment, design deficiencies, subsystem or component failure or procedural deficiencies may cause death or system loss. The safety target shall be based on internationally accepted standards.

(ii) Hazard Category II – Critical: Operating conditions such that personnel errors, environment, design deficiencies, subsystem or component failure or procedural deficiencies may cause severe injury to personnel, severe occupational illness or major system damage.
The safety target for the occurrence of all Category II hazards summed together shall again be based on internationally accepted standards.

(iii) Hazard Category III – Marginal: Operating conditions such that personnel errors, environment, design deficiencies, subsystem or component failure or procedural deficiencies, may cause minor injury to personnel, minor occupational illness or minor system damage.

(iv) Hazard Category IV – Negligible: Operating conditions such that personnel errors, environment, design deficiencies, subsystem or component failure or procedural deficiencies will not result in injury to personnel occupational illness or damage to the system.

(v) The Contractor shall submit a Schedule for Hazard Analysis Submissions within 30 days of Notice to Proceed. The Preliminary Hazard Analysis shall be submitted within 6 months of Notice to Proceed. This draft shall include a comprehensive assessment of potential equipment failure modes during normal operating and overload conditions and assess the performance of

the equipment for a range of hazard conditions. The final draft shall be submitted by the completion date of final design.

2.2.8 The Contractor shall prepare a Fire Safety Design Report for review and acceptance by the Engineer. This shall be submitted within 2 months after Notice to Proceed and revised and updated for the completion of the preliminary, pre-final and final design stages. Materials used in the Permanent Works of the system shall conform to fire safety requirements of BS 6853: 1999, or the latest edition of other equivalent international standards, subject to the acceptance of the Engineer.

N.B. Whichever Standard is selected for meeting the Fire Safety Criteria, then that standard shall be declared, and its requirements shall be met consistently throughout the Specification

2.3 Results

2.3.1 Source of all failure rates employed shall be indicated in the Hazard Analyses and shall be as far as possible independently established by recognised standards authorities. .

2.3.2 All hazard analyses submitted to the Employer are to be standardised by the Contractor such that format and forms employed by all sub-contractors are the same.

2.3.3 The following targets shall be employed for the Fault Tree Analysis

(i) No single point failure shall lead to death.

(ii) No combination of undetected failure and double point failures shall result in death.

(iii) No combination of undetected failure and single point failure shall result in major injury.

2.3.4 The procedures for training and the Contractor's Quality Assurance manuals shall incorporate resolution of hazards identified from this hazard analysis. Proper cross-referencing to the hazards and resolution measures shall be provided in all these aforementioned documents.

* End of Appendix 2 *

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Appendix 3

3. SUBMISSION FOR REVIEW REQUEST FORM

SUBMISSION FOR REVIEW REQUEST

Reference No. *(see Paragraph 4.3.2)* Date _____

Programme reference and scheduled date: _____

Submission Stage *(see Paragraph 3.5.1.1)*

Title _____

We hereby submit for review by the Engineer the documents or articles listed below:

(Introduction and list of items submitted – see Paragraph 4.3.5.2 – continue on separate sheet if necessary)

I confirm that the material submitted is in full compliance with the Contract.

Signed _____(Contractor's responsible engineer)

Engineer's Response Dated _____

The material submitted has been reviewed and the following decision is given:

"No Objection" / "No Objection Subject To" (see below) / "Rejected" (see below)

The following comments are made and a re-submission is to be made by the Contractor within 10 working days demonstrating fully how all of these are taken into account:

(Engineer's comments)

Signed _____ (Engineer)

∗ End of Appendix 3 ∗

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Appendix 4

4. SCHEDULE OF ITEMS TO BE SUBMITTED BY CONTRACTOR

This Appendix lists the principal items to be submitted by the Contractor for review by the Engineer. This list is not exhaustive and the Contractor is reminded to satisfy itself of the requirements for all submissions whether or not they are included within this Appendix.

Article	Reference Paragraph(s)	To be submitted
Initial version of the Works Programme	2.4.1.1	Within 7 days of the Commencement Date of the Works
Works Programme	2.4.1.2	Within 21 days of the Commencement Date of the Works
Procurement and Manufacturing Programme	2.5.1	Within 15 days of the Commencement Date of the Works
Installation Programme	2.6.1	Preliminary version within 30 days of the Commencement Date of the Works. Full version as stated in the PS or as directed by the Engineer
Testing & Commissioning Programme	2.7.1	Preliminary version within 30 days of the Commencement Date of the Works. Full version as stated in the PS or as directed by the Engineer
Monthly Progress Report and supporting documentation	2.10.1	The 5th day of each month.
Contractor's Project Plan	3.1.2	As stated in the PS, or if none is given, within 15 days of the Commencement Date of the Works
Particulars of Contractor's Representative	3.3.1.5	30 days before the Commencement Date of the Works
Interface Management Plan	3.3.2 b)	Within 30 days of notification from the Engineer of the identity of each Project Contractor
Detailed Interface Document	3.3.2 d)	Within 30 days of notification from the Engineer of the identity of each Project Contractor
Procurement, Manufacturing and Delivery Plan	3.5.1	As stated in the PS, or if none is given, within 20 days of the Commencement Date of the Works
Contractor's Health and Safety Documentation	3.6.2.2	Within 30 days of the Commencement Date of the Works
Environmental Management Plan	3.6.3.3.3	30 days prior to the commencement of construction activities
Environmental Mitigation Implementation Schedule (EMIS)	3.6.3.4.2	30 days prior to the commencement of construction activities
Traffic Management Submissions	3.6.3.5	30 days before implementation proving all relevant details and implications
Commissioning Plan	3.7.2.1	First draft within 120 days of the Commencement Date of the Works

Article	Reference Paragraph(s)	To be submitted
Installation Test Schedule	3.7.2.2 b. (i)	As stated in the PS or if not given, not later than two months in advance of the Date scheduled for commencement of respective tests
Integration Tests & Commissioning Plan	3.7.2.2 b. (ii)	As stated in the PS or if not given, not later than three months in advance of the Date scheduled for commencement of Tests on Completion
Training Plan	3.7.3.1	As stated in the PS or if not given, not later than six months prior to the issue of the Taking Over Certificate for the Works
Defects Liability Management Plans	3.7.4	Upon issuance of the Taking Over Certificate
Project Document Control Procedure	4.3.2	Within 15 days of the Commencement Date of the Works
Quality Manual	5.2.3	Within 30 days of the Commencement Date of the Works
Quality System Procedures	5.2.3	Within 30 days of the Commencement Date of the Works
Management Quality Plan	5.3	Within 30 days of the Commencement Date of the Works
Manufacturing Quality Plan	5.4	30 days prior to the commencement of the manufacturing works
Site Quality Plan	5.5	30 days prior to the commencement of the construction works
Reports of Quarterly Quality Audits	5.7.2	Every Three months
Quality Control Register	5.8	7th working day of every month
Packaging Materials & Procedures	7.3.1	As stated in the PS, or if none is given, within 30 days of the Commencement Date of the Works
Installation Tests Reports	8.1.5.3	Immediately after the completion of each test
Integration Tests & Commissioning Records	8.1.6.8	Immediately following the successful Tests on Completion of the system
Service Trial Records	8.1.7.8	Immediately following the successful Service Trial of the system
Summaries of Inspection and/or Test	8.3.11	7th day of the following month
Construction & Installation Plan	10.1.1	As stated in the PS, or if none is given, within 20 days of the Commencement Date of the Works, and in any case not less than 5 weeks before starting the construction of the Works on Site
Proposals for the construction of the Engineer's Site Offices	11.6.2.7	Within 14 days of the Commencement Date of the Works
Particular Uses of Site	13.2.1	Within 14 days of the Commencement Date of the Works
Method Statements Programme	14.5.6.3	Within 30 days of the Commencement Date of the Works or at a date reviewed by the Engineer
Detailed written report of accidents, incidents and dangerous occurrence	14.6.4.1	Within 7 days of occurrence/accident

Article	Reference Paragraph(s)	To be submitted
Name and qualification of safety representative for temporary site electricity	18.3.1	Not later than 4 weeks before appointment

* End of Appendix 4 *

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Appendix 5

5. REQUEST FOR INSPECTION OF WORKS FORM

JAIPUR METRO RAIL CORPORATION

CONTRACTOR

REQUEST FOR INSPECTION OF WORKS

To the Engineer Date

* Location) Will be ready for your inspection
) on
* Description of Works) at prior to
)
) on at hrs

* Labour and plant to be used

Signed for Contractor. Received by
for Engineer
Date
Time

Filled in by Engineer

Mr Please arrange inspection
Mr Please check setting out
Signed

Filled in by Inspector

The above work was inspected and permission was given / not given to proceed with next operation.

* The following remedial works were required

* Contractor informed verbally (to MR by Mr on At hrs)

***** Remedial works inspected and permission given to proceed with next operation on At hrs) as supervised by
Signed
Date Time

Verbal or written permission by the Engineer or his staff shall in no way relieve the Contractor of his responsibilities under the Contract.

* To be completed if applicable.

End of Appendix 5 *

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APPENDIX 6

6. NOISE MONITORING INSTRUMENT

Noise Monitoring Instrument

(1) Noise level meter, acoustic calibrator, portable wind speed meter and tripods shall be provided for the use of the Engineer.

(2) Noise level meter shall comply with the International Electro-technical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1), and other noise measuring and analysis instrumentation shall be of a comparable professional quality.

(3) The noise level meter shall measure noise in terms of the A-weighted equivalent sound pressure level (Leq).

(4) The acoustic calibrator shall be able to generate a known sound pressure level at a known frequency.

(5) The portable wind speed meter shall be capable of measuring the wind speed in m/s.

* End of Appendix 6 *

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Appendix 7

7. FIRST AID REQUIREMENTS

7.1 Provisions by others

(1) First aid bases will be located at the main Civil works Contractor's principal Works Areas. The bases will consist of a treatment room fitted with two treatment couches, a hand wash basin, sterilising equipment and lockable cupboards to contain sufficient medical supplies for the Contractor's workforce, the Engineer's site supervisory staff, the Designated Contractors working in the area and any visitors to the Site. The first aid post will be air-conditioned, with cooling capability sufficient to maintain the temperature of the inside of the building at 20°C.

(2) A qualified doctor, nurse and assistant nurse will be in attendance at the first aid base during all times when work is being undertaken on the Site, including work by the Designated Contractors and periods when only emergency activities are being undertaken, such as during periods of inclement weather.

(3) A fully equipped ambulance and driver will be provided at the first aid base during all working hours. The ambulance will be equipped with emergency life support equipment suitable for application in construction site accidents.

7.2 Provisions by the Contractor

7.2.1 The Contractor shall supply portable first aid boxes maintained fully equipped at each local site offices and any work locations where 20 or more persons work at a time.

7.2.2 In each site office and work location at least one of the Contractor's employees shall be trained in first aid and should be available at all working hours for purpose of attending to emergencies.

7.2.3 The Contractor shall be responsible for making his employees aware of the location and access route to the nearest first aid base and if necessary shall provide facilities for evacuating a workman by stretcher from the worksite.

7.2.4 The Contractor shall keep the first aid base personnel informed of the number and identity of staff working within the area of responsibility of each first aid base.

∗ End of Appendix 7 ∗

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Appendix 8

8. WORKS AREAS

8.1 Works Areas

(a) Temporary occupation of land is governed by Part VI of land acquisition Act 1894, which limits occupation to 3 years.

(b) The Site is divided into a series of principal Works Areas that will be made available to the Contractor at different times and for various duration. These Works Areas are illustrated in the Drawings. In order to avoid doubt, should any discrepancies be found in the definition of the extent of these Works Areas between the Figures in this Appendix and the Drawings, the Drawings shall prevail.

(c) The descriptions of the principal Works Areas are indicative and the Contractor shall satisfy its self as to the exact nature of the various Works Areas and the extent of works to be carried out prior to the execution of the Permanent Works or making use of the area as working space and/or for temporary site facilities.

(d) In addition to these principal Works Areas, the Contractor will be required to establish secondary Works Areas at, for example, station locations. The Contractor shall submit to the Engineer proposals for the use and occupation of these secondary Works Areas, such submissions being at least sixty (60) days prior to the programmed use of the specific Works Area.

(e) Prior to the Key Dates or the Works Area Handover Dates for returning any Works Area, the Contractor shall carry out the following works:

(i) construct all Permanent Works within the area, to the extent defined in this Appendix, in accordance with the requirements of the Contract,

(ii) reinstate the area to the condition as close as possible to its condition when it was taken over,

(iii) form the area to the approved lines and levels and carry out such other works as may be required by the Engineer,

(iv) remove all rubbish, debris and other materials.

∗ End of Appendix 8 ∗

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-II REQUIREMENTS

Section 6 – Employer's Requirements (ERQ)

Vol. II – Particular Specifications

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

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CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

1.1.1 Scope and Purpose

1. This specification defines the objectives, guidelines and requirements for supply, installation, testing and commissioning of Track work on ballastless sections of Phase 1B Corridor of Jaipur Metro Project.
2. The works to be executed under the contract including supply of HH Rails, Turnouts and fastening system 336, verification, delivery, installation, testing, including integrated testing and commissioning, technical support, training of Employer's staff and documentation for a complete system necessary to deliver the requirements of this specification.
3. Fastening system for ballastless track is "Fastening System 336" contractor will have to build the track plinth accordingly.

1.1.2 Relevant Documents

This specification should be read in conjunction with the General Conditions of Contract (GCC), the Special Conditions of Contract (PCC), the General Specifications (GS), Employer's Drawings and any other document forming part of the Contract.

In the event of a conflict between the GS and this Specification, this specification shall prevail.

The order of precedence, with item (a) below having the highest priority, is:

a) Particular Specification

b) General Specification

c) International Standards reference herein

d) Other International Standards

e) Indian Railway Standards

f) Indian Standards

g) Other National Standards

Notwithstanding the precedence specified, the contractor shall always immediately seek advice from the Engineer in the event of conflicts between specifications.

1.1.3 Verification of Design /Drawings

Although the responsibility for the design of the ballastless track lies with the Employer, the Track contractor shall bring out any shortcomings (if any) to the notice of the Engineer before starting the work or as soon as it comes to their notice whichever is earlier.

1.2 Overview of the Project

1.2.1 General

This chapter gives an overview of the Project and the information provided in this chapter is for reference only.

1.2.2 Phase 1B Corridor

1. Phase 1B Corridor, a heavy rail mass transit system on standard gauge covering a route length of about 2.25 Km underground, covering from Chandpole to Badi Chaupar.
2. Phase 1B Corridor has 2 Underground Stations.
3. 25kV AC single – phase Overhead Contact System (OCS) with Cab Signalling and Automatic Train Protection (ATP) / ATO will be provided on Phase 1B Corridor.
4. Phase 1B Corridor is scheduled to be opened for commercial services in the following stages –
   - Chandpole – Badi Chaupar – March, 2018

1.2.3 Responsibility of the Contractor

1. The Contractor shall be responsible for all track work for Phase 1B Corridor of about 2.25 km route length.
2. All stations are underground station with access from ground level. Access for track laying will be made available to the contractor in stages (Refer chapter 4).
3. The track on main line on underground tunnel shall be ballastless.
4. All the works shall comply to JMRC's Schedule of Dimensions and other approved laid down Technical specifications.

1.2.4 Necessity of approval under Metro Railway Act. 2002

In terms of section 7 of Metro Railways Act 2002, the Central Government has appointed the Commissioner of Metro Railway Safety (CMRS) and CMRS under section 8 shall inspect the metro railway with a view to determine whether it is fit to be opened for the public carriage of passengers and report there on to the Central Government as required by or under this Act. Under section 14 of the Act, the metro railway shall not be opened for the public carriage of passengers except with the previous sanction of Government under section 15 of the Act. The Commissioner shall inspect the metro railway and along with other aspects will examine that track work has been laid and comply with the requirements laid down by the Central Government (Ministry of Railways for this purpose).

CHAPTER 2

SCOPE OF WORK

2.1 Scope

1. This specification establishes the requirements for the manufacture, supply, installation, testing and commissioning of Phase 1B corridor track work. The Phase 1B Corridor shall be underground. The details of curves, turnouts, scissors x-overs, gradients, etc. have been shown in alignment drawings, the exact locations of which shall be interfaced by the contractor with designated civil contractors

2. The work area for this Contract has been demarcated at two/three locations at Phase 1B Corridor. The work area will also be made available to the contractor at any other location in Phase 1B Corridor, if required by the contractor, and the contractor shall have to interface with designated civil contractor for the same.

3. For welding of Rails, the bidder /JV Partner/ Consortium shall have MOU with RDSO approved Flush Butt Welding Plant for HH Rails, to carrying out welding work for the project.

4. The contractor shall be required to interface closely with the various Detailed Design Consultants and the designated civil/structural and system wide contractors on the Phase 1B Corridor appointed by Employer.

5. The scope of work shall include but not limited to the following:

    - Supply of P. Way materials such as 1080 grade head hardened rails, Turnout with all track fittings & fastenings, glued insulated joints, buffer stops, Fastening System 336. The contractor will make his own arrangements for mechanised handling and transportation of all materials to the site of work. The check rail with all fittings will be supplied by employer and the same will also be transported to the site by contractor.
    - Setting-out final alignment.
    - Welding of UIC 60 IRS-T-12-2009, UIC 60, 1080 grade head hardened rails using the specified welding techniques.
    - Provision of shear connector, wherever required, between 1st pour and 2nd pours reinforced concrete for ballastless track.
    - Laying of ballastless plain track on reinforced concrete RCC slab and ballastless turnouts on RCC slab, installing track fastener system, rail expansion joints, glued insulated joints, turn-outs, derailing switches, buffer stops, check rails etc. to the stipulated tolerances on the running lines.
    - Testing of components and installation methods

- The scope of work for the contract is further described in the Employer's requirements.
- Provide check / restrainmnet rails on curves sharper than the curve radius of 190 meters.

2.2 General Criteria and Track Parameters

2.2.1 General Criteria

SN	Criteria	Dimension
1	Gauge	1435 mm
2	Max. train speed a) Design b) Operating	95 Kmph 85 Kmph
3	Max. axle load, loaded condition	16 tonnes
4	Max. desirable gradient running track Absolute max.(compensated) gradient running track	3% 4%
5	Minimum vertical curve radius Minimum horizontal curve radius • Underground sections (main running lines) • Elevated & At-Grade sections (main running lines) • Depot and other lines	1500 m 120 m 120 m 100mts
6	Electric power connection	Over head contact system (OCS) – 25kv(AC)
7	Inclination of Rail	1 in 20
8	Wheel profile	IRS type
9	Rail profile	UIC 861-3

2.2.2 Track Structure Parameters

Description	Phase 1B Corridor	
	Ballasted	Ballastless (DFF)
Rail type Main line and Test Track	UIC 60, IRS-T-12-2009, 1080 grade head hardened	UIC 60, IRS-T-12-2009, 1080 grade head hardened
Rail type depot	UIC 60, IRS-T-12-2009, 880 grade	UIC 60, IRS-T-12-2009, 880 grade
Sleeper/base plate Spacing	Depot 650 +/- 20mm Main Line and Test Track 600 +/- 20mm	Main line (viaduct) 600 +/- 10 mm Main line (underground) 700 +/-10 mm Depot 700 +/- 20 mm (except for track on steel columns & embedded track where spacing shall be 1.2m centre to centre)

Description	Phase 1B Corridor	
	Ballasted	Ballastless (DFF)
Ballast cushion depth	Main Line & Test Track – 300 mm Depot – 250 mm	
Standard Rail length Main line & Test Track Depot line	 18 m 13 m	 18m 13 m
Maximum cant	110mm	110mm
Maximum cant deficiency	85 mm	85 mm
Maximum cant gradient Desirable	1 in 440 1 in 720	1 in 440 1 in 720
Rate of change of cant/cant deficiency Max. Desirable	 55mm/sec 35mm/sec	 55mm/sec 35mm/sec
Type of turnout (i) Main line (ii) Depot		a) Scissors x-over 1 in 9 type (Design speed 45 Kmph, permissible speed in service 40 Kmph) b) Turnout 1 in 9 type (Design speed 45 Kmph, permissible speed in service 40 Kmph) C) 1 in 7 (Design speed 35 Kmph,

2.2.3 Vertical Alignment

2.2.3.1 Points and Crossing

No change of grade shall be permitted on points and crossing.

2.2.3.2 Continuous Welded Rail

1. Long welded rail strings shall be joined to form continuous welded rails and finally fastened so that the zero thermal stress temperature lies within the following range of rail temperature values:

Surface (ballasted)	36 to 41 degree C
Surface (ballastless)	28 to 34 degree C
Underground tunnel (ballastless)	25 to 30 degree C

2. Mean rail temperature (in open) = 31 deg C

   Max rail temperature (in open) = 70 deg C

2.3 Schedule of Dimension

The contractor shall ensure that no permanent structure is within the structure gauge profile and the material & installation of track work shall comply with the provisions of schedule of dimensions. The schedule of dimensions is approved by Railway Board and any change to it shall be advised to the contractor.

The schedule of dimension shall be supplied to Contractor by the Engineer.

CHAPTER 3

INTERFACES

3.1 Object

1. This chapter describes the principal interfaces limit of scope between the Phase 1B Standard Gauge Corridor Track-Work Contractor and designated contractors.

2. This document refers to the following Contractors:

   - Construction of tunnel between Chandpole to Badi Chaupar, SG Corridors.
   - Construction of Underground Stations Buildings in Phase 1B corridor including Architectural Finishing, Water Supply, Sanitary Installation and External development work, etc. of Jaipur Metro Project.
   - Electrical Contractor: Supply, installation, testing & commissioning of 25 Kv Ac flexible OHE, sectioning post, 33 Kv cable network, ASS & SCADA Systems of underground sections of between Chandpole to Badi Chaupar, SG Corridors
   - Signaling & Train Control Contractors: For signaling, telecommunication and Train control of this corridors.
   - Rolling Stock Contractor**:** Design, manufacturing, testing & commissioning of Rolling Stock for Standard Gauge Corridors.
   - Any other designated contractor.

3.2 Interface with Designated Contractors

3.2.1 Interface specification: Track work installation Contractor Vs Electrical Traction Contractor

SN.	Scope	Electrical (Traction) Contractor Responsibility	Track Contractor Responsibility
1	Location of mast	Contractor shall make & provide the location of mast & provide the information to Track Contractor.	Track contractor shall provide and marks track centre all along the station and tunnels for installation of ROCS even without laying of tracks. Track contractor shall provide the necessary track geometry drawings with locations of rails expansion joints to Electrical Traction Contractor for designing the Rigid OCS installation in the tunnel and stations. Contractor shall verify the mast location in respect of mast implantation vis-à-vis track centre.

SN.	Scope	Electrical (Traction) Contractor Responsibility	Track Contractor Responsibility
2	Bonding Cables, Negative return cable, Traction Bonding cables, Cross bonding cables across insulated rail joints.	Shall supply, install and terminate cables at appropriate intervals/location by doing thermo weld to rails.	Contractor shall co-ordinate for location of thermo weld connecting to rails. In respect to location impedance bonds that may be required by the train control and signalling system, the contractor shall agree on the final location of impedance bonds, cross bonds or any other rail connections related to track current return.
3	Temporary return current continuity bonds at rail joints and on turnouts in depot.	Shall supply & install necessary lugs, cables in the holes drilled by Track Contractor to provide temporary return current continuity bonds.	During installation stage in depot area, Track Contractor shall drill holes in rails for installing temporary return current continuity bonds duly co-ordinating and interfacing with Electrical (Traction) Contractor, wherever required.
4	Cable Crossing.	Contractor shall accommodate cable crossing within the gaps provided by Track Contractor in track, in case of any specific additional requirement, Electrical Contractor shall indicate the requirement and shall provide necessary conduit to Track Contractor for providing the same under the track.	For any specific requirements of passage of traction cable under the track bed, Electrical Traction Contractor shall clearly indicate the requirement to Tracks Contractor. Electrical Traction Contractor shall provide necessary conduit for the cable crossing under the tracks. Contractor shall install the conduit for cable crossing
5	Earthing through track plinths.	Supply and connect the 35mm^2 bare copper cable to the BEC at required interval.	Supply and install connecting plate at every plinth end to ensure electrical continuity by providing M.S. flat at each end of the plinth duly connected with 35 mm^2 bare copper cable. The material details & specification of connecting copper cables shall be interfaced with Electrical Contractor.

3.2.2 Interface specification: Track work installation Contractor Vs Depot Installation Contractor

SN.	Item	Responsibility of Depot Contractor	Responsibility of Track Contractor
1	Depot Layout Drawing.	Shall supply depot layout drawing & its mathematisation to Track Contractor. Depot Contractor shall also supply detailed interface drawing of utility & depot construction. Depot Contractor shall modify the depot layout based on any discrepancy noticed by Track Contractor.	Shall install track based on depot layout drawing maintaining the clearance based on interface drawing supplied by Depot Contractor.
2	Installation of track in Workshop, Inspection Bay, Stabling Lines, ETU Workshop, Washing Plant, Blow down plant Pit lathe, Emergency team building and other areas of depot.	**Ballasted track:** Prepare the ground with grading and drainage, take care that all pipes and culvert crossing are laid. **Track on Column:** Supply & installation of column **Track embedded in concrete & track on plinth in washing line** - Prepare 1st pour concrete in the bed.	Install the track Install track on column Install track including laying of 2nd pour concrete.

3.2.3 Interface specification: Track work installation Contractor Vs Civil Construction Contractors

SN	Item	Responsibility of Civil Contractor	Responsibility of Track Contractor
A.	**STATIONS**		
1	Installation of track in stations.	Shall supply the track base according to layout drawing, prepare the track base with shear connectors, grading and drainage, take care that all pipes and culvert crossing are laid.	Shall install track based on layout drawing.
B	**VIADUCT / AT GRADE**		
2.	Construction of precast elements	**Construction:** Construction of precast elements for elevated structures (viaduct). Provision of vertical stirrups/connection (shear connector).	Construction of concrete plinth using the provisions of vertical stirrups /connection (shear connector) between precast elements and concrete plinth.

SN	Item	Responsibility of Civil Contractor	Responsibility of Track Contractor
3	Details of track drainage.	Design and construction of drainage system of line corridor except the drains required within track. Furnish details of levels of drainage systems.	Design and construction of Drains required within track based on details of levels of drainage system provided by Civil Contractor
4.	Clearance of track construction envelope.	Clear and hand over the track construction envelope as per the track construction program.	Ensure availability of track construction envelope in interface with Civil Contractor
5.	Storage facilities and utilization of access period for transportation of material to site.	Provide storage space and advise access period to Track to transport the track material at site.	Transportation of track material to site in interface with Civil Contractor in specified space and period so that the construction activities of designated contractor are not hampered after access period.
6.	Temporary water supplies for construction of track.	Design and construct in interface with Track Contractor requirement	Furnish details of requirement and location
7.	Details of Cant and platform levels	Shall furnish the required details	Shall take into account these values for track installation & determination of rail level / modification keeping in view the as constructed PF levels
C	**UNDERGROUND**		
8.	Construction of 1st and 2nd pour concrete	**Construction:** Construction of 1st pours concrete in Bored/ Cut and Cover box/circular tunnels. Provision of vertical stirrups /connection (shear connector) between 1st pour and 2nd pour concrete.	Construction of 2nd pour concrete utilizing the provisions of vertical stirrups/connection (shear connector) between 1st pour and 2nd pour concrete.
9	Details of track drainage.	Design and construction of drainage system of metro corridor except the drains required within track. Furnish details of levels of drainage systems.	Design and construction of Drains required within track based on details of levels of drainage system provided by Civil Contractor.
10.	Clearance of track construction envelope.	Clear and hand over the track construction envelope as per the track construction program.	Ensure availability of track construction envelope in interface with Civil Contractor.

SN	Item	Responsibility of Civil Contractor	Responsibility of Track Contractor
11.	Storage facilities and utilization of access period for transportation of material to site.	Provide storage space and advise access period to Track Contractor to transport the track material at site.	Transportation of track material to site in interface with Civil Contractor in specified space and period so that the construction activities of designated contractor are not hampered after access period.
12.	Temporary water supplies for construction of track.	Design and construct in interface with Track Contractor requirement and shall provide temporary water source at every station in tunnel	Furnish details of requirement and location
13.	Details of Cant and platform levels	Shall furnish the required details	Shall take into account these values for track installation & determination of rail level / modification keeping in view the as constructed PF levels.

3.2.4 Interface specification: Track work installation Contractor Vs Signalling Contractor

SN	Subject	Signalling Contractor	Track Contractor
1.	Electrical properties of track circuit assemblies.	Shall furnish the electrical requirements for track circuits. Any T & P/consumable of required electrical parameters shall be supplied by S & T contractor.	Shall install Signalling requirement with the track contractor.
2	Final track alignment & Profile Plan-details of curves, gradients etc.	Shall incorporate the same in Train Control & Signalling design.	Track Contractor shall provide the same for Line corridor giving the details of curves, gradients, location of fouling marks and also details of speed restrictions.
3.	Turn out assemblies and their mounting & driving arrangements.	Shall also coordinate with track contractor for Design & Installation of second drive arrangement.	Track shall supply & Install all Turnouts assemblies (Including the second drive), and provide for mounting arrangements for point machine including second drive assemblies.
4.	Insulated glued joints	Shall furnish the requirement & locations of all insulated glued joints to Track Contractor.	Shall supply & install all insulated glued joints at the designated locations as per requirements of Signalling Contractor.

SN	Subject	Signalling Contractor	Track Contractor
5.	Scope of Supplies – turnouts assembly and their mounting arrangement	Signalling Contractor shall supply & install the point machines, leading (1st) stretcher bar & co-ordinate with Track Contractor for installation of double pull arrangement, wherever required. Locking arrangement if any will be provided by signalling contractor.	Track Contractor shall install all track assemblies & Track fasteners, Turnouts, all stretcher bars (except leading stretcher bar) and second pull arrangement (where ever required) except locking arrangement. The installation of second pull arrangement shall be co-ordinated and interfaced with Signalling Contractor to ensure full compatibility.
6.	Testing of rail to rail, rail to sleeper and all insulated joints.	Shall arrange all testing after installation and coordinate with track contractor during installation and testing.	Shall arrange for testing of individual components before installation, preferably at the supply stage. The structure (including the rail surface) as installed shall be thoroughly cleaned to an acceptable standard as approved by the Engineer immediately after installation and as required thereafter to maintain the standard until the arrangement of service trials so as to provide adequate levels of electric insulation & rail surface quality for correct performance of train control & signalling equipment under prevailing climate & environment conditions.
7.	Track Crossings of Cables.	Shall furnish all track-crossing requirements to Track Contractor and provide pipes and support / or drilling of holes in the plinths.	Shall supply & provide all necessary Cut Outs on ballastless track as per the requirements of Signalling Contractor. The details and specifications of such crossings shall be interfaced with Signalling Contractor.
8.	Installation of trackside equipments and signal posts.	Shall furnish the final sizes of trackside equipments and co-ordinate with Track Contractor & to ensure compliance of schedule of dimensions (SG).	Shall co-ordinate with Signalling Contractor to ensure full compliance of schedule of dimensions.

SN	Subject	Signalling Contractor	Track Contractor
9.	Track connections	Shall supply and install in co-ordination with Track Contractor for track circuit bonding cables & point machine connections with track.	Shall co-ordinate with Signalling Contractor for track circuit bonding cables & point machine connections with track.
10.	Installation of points operation mechanism	Shall check the proper gauge, housing of point & operating of switches and all other items necessary from signalling point of view, Signalling Contractor shall make necessary adjustments to points operating mechanism as required by Track Contractor at the time of track parameters correction.	Shall provide proper gauge, housing of points & opening of switches and carry out all other works including proper packing as required to make the point suitable for installation of point machine by Signalling Contractor.
11.	Testing of points and crossings	Jointly test with Track Contractor during installation and while commissioning of points machines & during integrated testing & commissioning.	Jointly test the points with Signalling Contractor during installation and commissioning of points machines & during integrated testing & commissioning and rectify all defects pertaining to track, if any, identified during the testing & commissioning of points.
12	Turn out assemblies Second pull drive	Signalling contractor shall supply& install the point machines, leading (Ist) stretcher bar & Co-ordinate with track contractor for design and installation of double pull arrangement (secondary Drive arrangement), wherever required locking arrangement if any will be provided by signalling.	The design & installation of second pull arrangement (secondary drive arrangement) shall be co-ordinate and interfaced with signalling contractor to ensure full.
13	Testing of turnout after installation.	Shall arrange all testing after installation and co-ordinate with track installation & testing.	Track contractor shall co-ordinate closely with signalling contractor during installation & testing. The insulation level for insulated rail joint shall be >50M
14	Testing Joint plan	Signalling contractor prepared the joint test plan with Track contractor if required by S & T department.	Track contractor also develop joint testing plan in consultation with S&T contractor.

3.2.5 Interface specification: Track work installation Contractor Vs; Rolling Stock Contractor

SN	Item	Rolling Stock Contractor Responsibility	Track Contractor Responsibility
1	Track parameters related with wheel profile i.e. check rail, wing rail clearances etc.	Shall provide wheel profile details	Shall consider wheel profile details for working out related track parameter details
2.	Structure gauge	Shall provide kinematic envelope	Take into account for checking the infringement at construction stages
3.	Buffer stops	Shall provide details of Rolling Stock	Shall consider these details for supply and installation of buffer stops
4.	Integrated testing & commissioning	Shall provide results of test runs including those pertaining to track conditions.	Shall associate during integrated testing & commissioning and carryout necessary rectification of track.
5.	Simulation studies	Shall carry out simulation studies & provide results with respect to attainable speed along the alignment.	The values of cant to be provided on every curve shall be fine tuned based on the attainable speeds. The Track Contractor shall provide the cant accordingly during construction stage.

CHAPTER 4
INSTALLATION AND CONSTRUCTION SCHEDULE

4.1 Requirements

4.1.1 General Requirements

1. The Contractor shall comply with all Enactment in executing the works, including but not limited to all statutory provisions on occupational health and safety.
2. The Contractor shall co-ordinate with designated Contractors in the execution of the Works.
3. The Contractor shall also co-operate with all relevant authorities in the execution of the works.
4. All machinery and equipment shall be operated at all times by suitably trained and competent employees of the contractor and to the satisfaction of the Engineer.
5. Only appropriate tools, plant, machinery and equipment and vehicles shall be used.
6. The contractor shall, prior to starting any installation and construction work, identify any possible hazards, and implement measures of eliminating and/or controlling such potential hazards, in line with safe working practices.
7. Further details on Site Safety management are described in Chapter 14 and Appendix 2 of the GS. The Contractor shall ensure that all areas of work are sufficiently illuminated for the works to be undertaken and that a safe system of work is employed for all activities.
8. The contractor shall operate a suitable system for the control of persons entering or working on the site. The system shall include as a minimum:
    - Register of all employees with their level and permanent address, contract details etc.
    - Personal identification with photograph and signature/thumb impression
    - Levels of competence;
    - Date of joining
    - Date of discharge;
    - Register of all visitors.
9. The Contractor shall co-operate, at all times, with the Engineer and designated Contractors to ensure that the site is protected from unauthorised admission, either wilfully or otherwise.
10. The Contractor shall make due provisions for safe access to and egress from the site of works for its staff and subcontractors. This access shall be maintained such that it is free of all hazards and is in a safe condition throughout the duration of the works.

4.1.2 Specification Requirements

The installation and construction work pertaining to this contract shall include, but not be limited to the following: -

- Survey on site and review the technical requirements shown in this specification and the Employer's drawings.
- Finalisation of the construction and installation program
- Production of the calculation sheets and installation drawings for site installation.
- Installation in accordance with the finalised installation drawings.
- Co-ordination with designated contractors.
- Submission of the installation reports and records.
- Testing and commissioning as per finalised protocol and programme.
- Production of as built drawings, documents, calculations sheets, and records.

4.1.3 Construction and Installation Plan

1. The contractor shall undertake installation work in stages as shown in the detailed installation programme, Installation, testing and commissioning of later stages shall have no impact on revenue operations of earlier stages.
2. As a minimum, the detailed construction and installation plan shall include but not be limited to all the activities described in clause 3.6.1 of the GS, installation details and methods of all activities, equipment and tools to be used for installation, safety issues, supervision, temporary land occupation needed and the vehicles to be used for transportation of material & installation.

4.1.4 Temporary Works

1. The design of temporary works shall be submitted to the Engineer for approval.
2. All temporary works shall be removed on completion of permanent works, or as directed by the Engineer
3. All temporary works shall be clearly distinguishable from permanent works.

4.1.5 Site Supervision and Safety Issues

1. The contractor shall set up a site supervision system, which shall be part of the overall safety, system assurance and quality management system.
2. Details of Health and Safety requirements at site are described in Chapter 14 of the GS.

4.1.6 Quality Management

1. The Contractor shall adopt an appropriate quality management system to ensure that the System performance requirements as specified in this Particular Specification are achieved.
2. The Contractor shall provide sufficient number of suitably experienced supervisors and skilled workers to ensure that the progress and quality of the work, both on site and in the Contractor's workshops, are maintained to the satisfaction of the Engineer.
3. Key Supervisors shall have adequate previous experience in a supervisory capacity on similar projects.
4. The supervisors shall work on a fulltime basis during the entire installation process as directed by Engineer.
5. The Engineer reserves the right to undertake, at any time, checks on the proficiency of the Contractor's staff, licensing and all associated documentation. Should any of the Contractor's staff be found incompetent by the Engineer or unlicensed he shall be removed from the site until their competence has been established.

4.1.7 Workmanship

The style and procedure of workmanship shall be appropriate and consistent throughout the works.

4.2 Programme Requirements

4.2.1 General

In addition to the requirements specified in the General Specification, the contractor shall program the works in accordance with a pre-determined sequence to meet various Key dates and Access Dates so as to meet the target Dates of commercial opening.

4.2.2 Key Dates

1) The work includes a number of stages. These stages, which are inter-related with and essential to, the completion of the Supply, Installation and Commissioning of track work for Line corridor are to be achieved by the Key Dates.
2) The Key Dates are indicated in the Schedule of Key Dates and the deliverables for each Key date shall be achieved by the midnight of the date mentioned.
3) If the identified stage is not achieved by the stated Key Date, liquidated damages may become applicable as set out in the Contract.
4) Description of each stage is as detailed below:

STAGE 1: **Shared access to Electrical Traction Contractor / Signaling Contractor**

Shared access to Electrical Traction Contractor / Signalling Contractor shall be available, by this date.

Interfacing Contracts: Civil Contractor for Stations, Viaduct, At grade and underground section

Rolling Stock Contractor

Electrical (Traction) and cabling work contractor

Train Control and Signalling and Telecom Contractor.

STAGE 2: Completion of Track work

Achievement: Completion of track work in all respect with final finishes

Interfacing Contracts: Civil Contractor for Stations, Viaduct, At grade and underground section

Rolling Stock Contractor

Electrical (Traction) and cabling work contractor

Train Control and Signalling and Telecom Contractor.

STAGE 3: **Completion of Acceptance Tests and Taking Over of the System**

Achievement: Completion of Acceptance Tests after completing necessary integrated testing including testing. This stage can be achieved after completing all the above two stages by Signalling Contractor (fixing and testing of point machines).

Final taking over of the system after completing all the requirements of Operation and Maintenance including Training as laid down in the Employer's Requirements (GS and PS).

Interfacing Contracts: Civil Contractor for Stations, Viaduct, At grade and underground section

Rolling Stock Contractor

Electrical (Traction) and cabling work contractor

Train Control and Signalling and Telecom Contractor.

4.2.3 Access Dates

1) The Track Contractor shall require access to information as well as to various locations at stations/track/tunnel, etc., in stages, in order to plan his activities for time-bound completion of his obligations under the Contract. The dates on which such access becomes available are indicated in para 4.4 below. However the track contractor will be required to interface the access with relevant civil work contractors and plan the execution accordingly.

2) The Access Dates are defined as hereunder at 4.3.

STAGE 1: Track Work Installation

This represents the date by which the Track Contractor shall get shared access to work jointly with Civil Contractor and Electrical (Traction) Contractor at nominated area for Track work.

4.2.4 Scheduled dates for the Supply of Materials (to be supplied by the Employer)

4.2.4.1 Indicative Schedule for Supply of Check Rails with fittings

Check Rails with bracket and other fittings required for SG Corridor are available in JMRCL Operational Depots/JMRCL Stores within Jaipur. Contractor shall arrange transportation of same from JMRCL Operational Depots/Store to work site of Phases-1B Corridor. No extra payment shall be paid for transportation of these materials.

4.3 Schedule of Key Dates

Key Date	Status	Chandpole – Badi Chaupar	
		Location	Date
1	Partial Completion of track & shared access to signalling & traction contractor	Chandpole to Start of Chhoti Chaupar	Completion period will be 5 months for the patch for which partial Access given
		Chhoti Chaupar station to Badi Chaupar (excluding station)	
		Badi Chaupar Station & cross over portion beyond Badi Chaupar	
2	Completion of track work	Chandpole to Start of Chhoti Chaupar	After giving complete Access work is to be Completed in 6 Months
		Chhoti Chaupar station to Badi Chaupar (excluding station)	
		Badi Chaupar Station & end of reversal lines beyond Badi Chaupar	
3	Completion of Acceptance test and taking over the system	February – 2018	

4.4 Schedule of Access Dates

Access Date		Chandpole – Badi Chaupar	
1	Establish work site	Available on date of issue of letter of acceptance	
2	Access for installation for track work	**Location**	**Date**
		Chandpole to Start of Chhoti Chaupar	12.02.2017
		Chhoti Chaupar station to Badi Chaupar (excluding station)	12.02.2017
		Badi Chaupar Station & cross over portion beyond Badi Chaupar	17.02.2017

4.4.1 Indicative Chainages of Stations

The indicative chainages for station are given below, however for construction purpose. These shall be interface by the Contractor with designated civil contractor.

SN	Station	Chainage (In Meters)
A	**Chandpole – Badi Chaupar**	
1	Chhoti Chaupar	9418.249
2	Badi Chaupar	10271.560

4.5 Deleted

4.6 Survey Equipment

4.6.1 The contractor should provide the survey equipment, track measuring equipment and other accessories as per the instructions of Engineer as and when required. He should also provide all necessary help and manpower as required by the Engineer for checking the works, whenever required.

4.6.2 For the equipment like the buffers etc.

(a) A complete set of documentation must be supplied with each System. The documentation should be self-tutorial in nature and be readily understood by non-computer personnel.

(b) The following manuals must be supplied with the system:

(i) Manual on how to operate the equipment; and

(ii) Manual on how to use the facilities and software provided by the supplier. (Including languages and utilities).

CHAPTER 5

MATERIAL AND WORKMANSHIP: GENERAL

5.1 Introduction

1) This Materials and Workmanship Specification for Track work shall be read in conjunction with all the documents forming part of the Contract.
2) No Permanent Works shall be carried out until all methods and materials have been approved.
3) Unless noted otherwise in the Contract, all components and materials shall be handled, transported and stored, in accordance with the manufacturer's recommendations with prior approval of Engineer.
4) The test results of each test to be carried out as per Employer's requirement shall be recorded and submitted in a format approved by the Engineer and shall include graphical presentation of results as well as numerical base data where ever required
5) All drawings, records, reports, documents, proforma etc. shall be submitted in both hard copy and electronic copy.

5.2 Abbreviations

Track work Abbreviations	
CWR	Continuously Welded Rail
EVA	Ethyl Vinyl Acetate
FC	Flange way Clearance
HDPE	High Density Polyethylene
HH	Head Hardened
GIRJ	Glued Insulated Rail Joint
LWR	Long Welded Rail
HVN	High Viscosity Nylon
REJ	Rail Expansion Joint
P&C	Point & Crossing
Standards Abbreviations	
EN	European Standards
DIN	German Standards
AREA	American Railway Engineering Association
UIC	International Union of Railways
IEC	International Electro-technical Commission
Other Abbreviations	
E&M	Electrical and Mechanical
OHL	Overhead Line
HTS	High Tensile Strength
DFF	Direct fixation fastener
BEC	Burried Earth Conductor
ETU	Electric traction unit

5.3 Standards

Track work materials, components and assemblies shall comply with the requirements and Standards given in the present Specification, however, it shall be the responsibility of the contractor to adopt the latest version of the technical specification with all correction slips.

Codes and standards

1. International Union of Railways Standard Codes (UIC)

UIC Code 860 – 0	Technical Specification for the supply of Rails
UIC Code 861-3	Standard 60 kg/m Rail Profiles Types : UIC 60 and 60 E
UIC Code 864 – 2	Technical Specifications for Supply of Steel Track Bolts
UIC Code 864 – 3	Technical Specifications for the supply of spring steel washers for use in Permanent Way.
UIC Code 864 – 4	Technical Specification for supply of Fishplates or sections for Fishplates made of rolled steel
UIC Code 864 – 5	Technical Specification for the Supply of Rail Seat Pads
UIC Code 864 – 8	Rolled Profiles for Fishplates for 54 kg/m and 60 kg/m Rails
UIC Code 866 – 0	Technical Specification for the supply of cast manganese steel crossings for switch and crossing work

2. International Organisation for Standardisation (ISO)

ISO 1113	Information Processing – Representation of the 7 bit coded character set on punched tape
ISO 1191	Plastics – Polyethylene and Polypropylenes in dilute Solution-Determination of viscosity number and of limiting viscosity number.

3. Indian Standards (IS)

IS 456 (2000)	Code of Practice for Plain and Reinforced Concrete
IS 800 (1984)	Code of Practice for General Construction in Steel

4. European Standards (EN)

EN 1561	Founding – Grey Cast Iron
EN 1562	Founding – Malleable Cast Irons
EN 1563	Founding – Spheroidal Graphite Cast Irons

5. (Deleted)

6. German Standard (DIN)

DIN 53455	Testing of Plastics – Tensile Test
DIN 53479	Testing of Plastics and Elastomers – Determination of Density
DIN 53508	Testing of rubber - Accelerated ageing

7. International Electro-technical Commission (IEC)

IEC 60093	Method of testing for volume resistivity and surface resistivity of solid electrical insulating materials (Formerly DIN 53482)

8. (Deleted)

9. Indian Railway Standards

IRS T-1	Fish plate
IRS T-10	Switches, crossing and REJs
IRS T-12	Rails
IRS T-19	Fusion welding of rails by Alumino-thermic process
IRS T-23	Fish bolts and nuts
IRS T-28	High Tensile steel fish bolts and nuts
IRS T-29	CMS crossings
IRS T-31	ERC
IRS T-37	GR sole plate (for 6 mm sole plate pad and any other relevant specification)
IRS T-39	PSC sleepers for plain track
IRS T-45	PSC sleeper for turnouts
IRS T-44	GFN-66 liners
IRS T-46	SGCI inserts

Indian Railway Manual for Alumino-thermic Welding
Indian Railway Manual for flash butt Welding
Indian Railway Manual for Ultra Sonic Testing of Rails and Welds
Indian Railway Manual for LWR
Indian Railway Manual for Glued Insulated Joint

OTHERS

A	**Cement**	
	IS: 269	specification for 33 grade ordinary portland cement
	IS: 650	specification for standard sand for testing of cement
	IS: 4031	methods of physical tests for hydraulic cement
	IS: 4032	method of chemical analysis of hydraulic cement
	IS: 6925	methods of test for determination of water soluble chlorides in concrete admixtures
	IS: 8112	specification for 43 grade ordinary portland cement
	IS: 12269	specifications for 53 grade ordinary portland cement
B	**Concrete**	
	IS: 383	specification for coarse and fine aggregates from natural sources for concrete
	IS: 456	code of practice for plain and reinforced concrete
	IS: 516	methods of test of strength of concrete
	IS: 1199	methods of sampling and analysis of concrete
	IS: 2386	parts i to vii. methods of tests for aggregates for concrete
	IS: 7861	parts i and ii. code of practice for extreme weather concreting
	IS: 10262	recommended guidelines for concrete mix design
	IRS	concrete bridge code
	IRC: 21-1987	standard specifications and code of practice for road bridge section – III cement concrete (plain & reinforced (first revision)
	IS: 9103	specifications for admixture for concrete

C	**Formwork**	
	IS: 456	code of practice for plain and reinforced concrete
	IS: 4990	plywood for concrete shuttering work
	IRC: 87	guidelines for design & 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 purposes
	IS: 1239	specification of mild steel tubes. tubular and other wrought steel fittings
	IS: 2750	specification for steel scaffoldings
D	**Steel Reinforcement**	
	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: 456	code of practice for plain and reinforced concrete
	IS: 814	PARTS I & II electrodes for metal arc welding of structural steel
	IS: 816	code of practice for use of metal arc welding for general construction in mild steel
	IS: 1566	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 & steel
	IS: 4759	hot-dip zinc coating of structural steel and other allied products
	IS: 2751	code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction
	IS: 9417	recommendations for welding cold-worked steel bars for reinforced concrete construction

10. The relevant technical specifications and manuals etc. of Indian Railways have been mentioned in clause 5.3 (9), however, it shall be the responsibility of the contractor to adopt the latest revision of relevant technical specification/manual of Indian Railways with all correction slips and alterations. The contractor shall be responsible for collecting the relevant technical specification from Indian Railways at his own cost and shall submit them to the engineer for his approval before starting of work.

11. The relevant RDSO Drawings shall be followed, wherever required, for those track work / track items which are required to be manufactured/procured based on Indian Railway specifications. However, it shall be the responsibility of the contractor to adopt latest RDSO Drawings with all corrections and alterations. The contractor shall be responsible for collecting the relevant drawings from RDSO at his own cost and shall submit them to the engineer for his approval before starting of the work.

5.4 Testing and Inspection

1) All materials and components shall be tested and inspected in accordance with Chapter 9.

5.5 Packaging, Shipping and Storage

1) All materials, components or assemblies to be supplied by the contractor shall be packed & transported without causing any damage to it. The materials shall be offered for Engineer's inspection at contractor's storage depot for this project in Jaipur before installation. The material classified as damaged by Engineer shall not be used for the work.

2) All materials including the material supplied by the Employer shall be stored and protected in neat, well maintained stacks, bundles or enclosed stores with markings clearly visible.

3) Materials shall be so stored as to ensure no deterioration due to water or any other reason.

4) All material storage arrangements shall be with prior approval of the Engineer

5) The materials and equipment having specific provisions of packaging & storage shall be packed and stored in accordance with their technical specifications in addition to that described above.

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CHAPTER 6

MATERIAL & WORKMANSHIP: MATERIALS AND COMPONENTS

6.1 Material

6.1.1 Material to be supplied by the Employer

Check Rails with bracket and other fittings required for SG Corridor are available in JMRCL Operational Depots/JMRCL Stores within Jaipur. Contractor shall arrange transportation of same from JMRCL Operational Depots/Store to work site of Phases-1B Corridor. No extra payment shall be paid for transfer of these materials.

Spare HH Rails 1080 grade, Turnouts, Fastening and other items supplied under SPM1 are required to be handed over to O&M / Jaipur MRTS. No additional payments shall be made for handling, re-handling, loading unloading, transportation or for any other activities involved while handing over of these spare to O&M / Jaipur MRTS.

6.1.2 Materials procured by the contractor

The 1080 grade HH rails, Turnouts with its fittings, MSS, Buffer stop and Fastening System 336 shall be imported by the Contractor as CIF Mumbai port. The contractor shall be responsible for all the remaining activities on arrival of these materials at Mumbai port such as their clearances & taking delivery of these materials including coordination with the customs authorities, shipping lines, port authorities etc. complete. The contractor shall be responsible for project import registration for availing the concessional custom duty. The contractor shall also be responsible for their safe transportation from Mumbai port to site at Jaipur without causing any damage to them duly taking proper care & precaution & following appropriate methods including loading, unloading, local transport and temporary storage at Mumbai (if required), handling / re-handling, coordination with port and transport authorities, obtaining necessary transport permit including demurrage (if any), transit insurance and proper stacking/storage with proper accountal etc. as directed by engineer.

6.2 Rails

6.2.1 Rail Sections

1) The rail section shall be as per Table 1

Table 1

Item	Rail type	Rail profile
(i) Standard Rails on main line (ii) All glued insulated joints on main lines and depot lines (iii) All turnouts of main line	UIC 60, IRS-T-12-2009, 1080 grade, head hardened	UIC 861-3
Check rails on level crossing,	IRS 52 kg type (may be second hand released rails)	IRS 52 kg type

2) The Contractor shall take necessary approval/permission from concerned authority for transportation of rails in Jaipur by Road.

3) The contractor shall be responsible for preparing the firm and level ground for stacking of Rails as approved by the engineer. The contractor shall also arrange the required wooden battens/spacers for keeping rails in layers as directed by the engineer.

4) The technical specification of UIC 60 Rails/ IRS-T-12-2009 are given at **Annexure-4**

6.3 Track Components

6.3.1 Deleted

6.3.2 Rail Fastening System for Ballastless Track

1) All plain line ballastless track for main line shall be laid with Fastening System 336.

2) The components of fastening system 336 shall be:

   a) Anchor bolts
   b) Tension clamp
   c) Pad/Base plate shim
   d) Base plate Elastic Pad
   e) Cast iron Base Plate
   f) Insulating bush
   g) Helical Spring
   h) Collard washer for anchor bolt
   i) Hexagon Nut
   j) Rail Pad
   k) T-Head bolt with washer & nut
   l) Washer

3) Straight track shall be laid with 2 anchor bolts while curved track including transition portion shall be laid with 4 anchor bolts.

4) The toe load per Clip shall be 10.5 KN +/- 1.5 KN and the static creep resistance of one rail seat assembly of the fastening system shall not be less than 9 KN for UIC 60 rails.

5) All technical details for supply of fastening is given at **Annexure-2**.

6) Eccentric insulating bushes equal to 5% of insulating bushes required for installation of track shall be supplied as spare material

6.3.3 Standard Fishplates and Fish bolts

Standard fishplates and fish bolts shall be suitable for use with UIC60 rail section and shall be of four bolt type and shall be manufactured in accordance with the relevant technical specifications of Indian Railway as mentioned in clause 5.3(9).

6.3.4 Glued Insulated Rail Joints

The Glued Insulated Rail Joints (GIRJ) shall be manufactured in accordance with the RDSO Drawing no. T - 5843 and relevant Technical Specifications/manuals of Indian Railways as mentioned in clause 5.3(9) for the Supply of Glued Insulated Rail Joints.

6.3.5 Deleted

6.3.6 Deleted

6.3.7 Approved Manufacturers

The Contractor shall submit to the Engineer for each item or component to be manufactured, full details of the previous relevant experience of the proposed manufacture in the production of that item, and also previous experience of manufacturing similar products for the Railway industry. The major items that require particular and specific previous manufacturing expertise and require prior approval of the Employer are as follows:

(a) Friction buffer stops;

(b) Concrete sleepers for plain line and turnouts;

(c) Fastening components of ballasted track.

6.4 Turnouts, Crossovers and Diamonds

6.4.1 General

1) On main line, the following types of turnouts and diamond crossing shall be provided as indicated in the relevant drawings

   a) 1 in 9 type turnout (ballastless)

2) All turnouts, diamond crossings shall be provided on reinforced concrete slab for ballastless track.

3) The Contractor shall be responsible to make provisions on PSC sleepers / reinforced concrete slab for fixation of point driving machines, 2nd drive arrangement (in case of 1 in 9 turnouts) and any other arrangements required for fixation of S & T equipment duly interfacing with designated signalling contractor with prior approval of Engineer.

4) Turnouts on main lines and depot lines shall be incorporated to take the LWR through turnouts.

5) All turnouts, diamond crossings and derailing switches on main lines and depot lines shall be laid with canted rails with an inward slope of 1 in 20. The top surface of the PSC sleepers at rail seats shall be flat and the 1 in 20 rail cant

shall be achieved by providing suitable intermediate pads on rail seats as per the approved design of turnout manufacturer.

6) The sleepers for turnouts/derailing switches and scissors x-over for ballasted track shall be suitable for installing turnouts/derailing switches and scissors x-over to be supplied by the Employer. The details required for this purpose shall be provided by the engineer. Any modification required in the sleepers & SGCI insert dimensions etc. suiting the design of turnout/derailing switches and scissors x-over shall be incorporated in the sleepers by the contractor. These sleepers shall be manufactured only after all the interface issues with S&T designated contractor & design of turnout/derailing switches and scissors x-over (to be supplied by the Employer) have been resolved/finalised & the relevant details including those pertaining to the sleepers of turnouts/derailing switches, scissors x-over have been approved by the engineer. The sleepers for turnouts/derailing switches and scissors x-over to be supplied and manufactured by the contractor, shall be fully compatible to the turnout/derailing switches and scissors x-over design as finalised & approved by the Employer.

7) Technical Specification for supply of Turnouts etc is placed at **Annuxure-3**

6.5 Check rails / restrainment rails on Curves

The contractor shall be responsible to provide the check rails / restraiment rails as per the design approved by the employer on all curves steeper than 190 mts radius. Track Structure will be different to accommodate check rails. Check rails and modified fastening shall be supplied by employer.

6.6 Buffer Stops

On main lines and depot lines friction buffer with mechanical impact absorption (non-hydraulic type) shall be provided. The design and specification of friction buffers shall be submitted by the contractor for Engineer's approval. The contractor shall interface with the designated Rolling Stock Contractor for the details required for the design of friction buffer stops. However, the following details shall be followed.

- Weight of empty train is equal to 246 tonnes for 6-car train set without passengers.
- Weight of train is equal to 376 tonnes for 6-car train set with passengers.
- Impact velocity for main line & test track: 25 km/h
- Impact velocity for depot line: 10 km/h.

6.7 Deleted

6.8 Concrete Plinth/slab (Ballastless Track)

6.8.1 General

Ballastless Track shall be with reinforced concrete slab in tunnel.

6.8.2 Concrete

1) The concrete shall be of M35 grade as per the Indian Standard IS-456 – 2000. The concrete shall be in accordance with the provisions mentioned in **Annexure-1** of PS.

6.8.3 Reinforcement

1) Reinforcement & shear connector between CW interface and concrete plinth shall be of IS1786 in accordance with relevant IS codes. The reinforcement shall be in accordance with the provisions mentioned in **Annexure-1** of PS.

2) Electrical Interface:

- The plinth/slab electrical continuity shall be ensured by the contractor. The Contractor shall supply and weld a connecting M.S. flat welded to the plinth reinforcement. This M.S. flat shall be 160x40x8 mm, pre-drilled with a 6-mm diameter hole, and shall be installed at each plinth / RCC slab unit extremity. These M.S. flats shall be connected by the Contractor with equivalent 35 mm^2 bare copper cable to provide electrical continuity between consecutive plinths duly interfacing with the designated electrical contractor.

6.9 Alumino-Thermic Welding Portion

The welding portion and equipment required for the alumino-thermic Rail welding process shall be manufactured and tested in accordance with relevant Technical Specifications for approval of the process and supply of portions for Fusion welding of rails and performance and acceptance of alumino-thermic welding of rails of Indian Railways as mentioned in clause 5.3(9).

6.10 Signal and Traction Return Rail Bonds

At locations shown on the Drawings, and/or specified, signalling and/or traction return rail bonds are to be attached to the rail through holes, brazing, thermo welds or any other suitable technique by designated contractors as approved by Engineer.

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CHAPTER 7

MATERIAL AND WORKMANSHIP: SURVEY AND SETTING OUT

The setting out of alignment for track construction shall be the responsibility of the contractor; the following principles shall be adopted for setting out and execution.

7.1 Functional Responsibilities

1. The planning organisation and process of surveys for transferring the alignment for track construction on finished at grade/tunnel sections/stations shall be the sole responsibility of the Contractor. He shall at all times maintain common survey interface with the Civil Contractors.
2. Survey and setting out of works shall be carried out by surveyors of appropriate experience and qualification as approved by the engineer.
3. The Engineer may carry out random checks to verify the accuracy of the setting out and Contractor's compliance of the completed works with given alignment and the specifications. Provisions and arrangement shall be made by the Contractor to facilitate the checks. However, full responsibility lies with the contractor for the accuracy of line and level of the tracks.

7.2 Survey Controls in General

1. The contractor shall interface with designated civil contractors to take over the reference co-ordinates system (x,y,z) of the project area as defined by the JMRC. The Secondary Survey Control Markers are additional points to be established by the contractor along alignment or in the depot from the reference co-ordinate system including bench mark thus providing survey control for the work areas. The Contractor may also establish additional survey control Markers as local grids or reference system for setting out particular sub-set of work.

7.3 Secondary Survey Controls

1. As each section of track or depot becomes available the contractor shall submit a schedule of secondary Control Markers and Bench marks for that area duly interfacing with designated contractor. The Survey Control Markers and Bench Markers shall be used for the control of the works. The Contractor shall verify the relative accuracy of the Survey Control Markers and Benchmarks prior to use.
2. All the Survey control markers and benchmarks provided within the project area by the designated civil contractors shall be surveyed, with survey computations based on the adopted co-ordinates system. Any changes in values shall be supported by technical evidence and on consultation with all affected parties.
3. In particular, any changes in co-ordinate values of secondary survey markers shall only be adopted with the concurrence of the Engineer. The contractor shall

be responsible to prepare modified drawings/proposals in this regard for information to all concerned parties and for approval of the engineer.

4. It shall be the Contractor's responsibility to protect and preserve the integrity of the all Control Markers. In the event that any of the Secondary Control Markers or Benchmarks is damaged, the Contractor shall replace and re-establish the points at his own cost to the satisfaction of the Engineer.

7.4 Setting Out

1. Setting out points shall be established by transfer from the survey control Markers. The Contractor shall establish physically on site such track setting marks that may be grid or offset points to be used as the reference system for the track work. In the event the original structural grid line are destroyed or rendered unusable, the Contractor shall re-establish them at his own cost without delay.

2. At each site, the position of the site main reference setting out points shall be maintained throughout construction period. Such markers shall be checked against the Survey Control markers by the Contractor at regular intervals to ensure reliability of subsequent works.

3. The track setting marks corresponding to both the theoretical centre of the track and to the theoretical level of the track running surface, as defined by the relevant topographical data on the documents relating to track layout shall be marked at the beginning and end of each circular curve, transition curve and vertical curve both in the longitudinal and cross directions. The said markings shall be put in:

   - In straight sections: every 25-m,

   - In curved sections: every 10-m.

   The track setting marks for the centre of the track shall be shown by plates or nails sealed on the tunnel section, on at grade section or as approved by Engineer. They shall be referenced by the Cartesian co-ordinates of each point identified in this manner, and registered in the topographical logbook. Should there be any discrepancy found by the contractor with reference to the geometry of civil structure, the same should be interfaced with the civil contractor. The contractor shall be responsible to prepare details duly making necessary modifications in layout, if required as a solution to the discrepancy and submit the same to the Engineer for his final decision.

   The track setting marks for the vertical setting of the track running surface shall be shown by angle plates sealed onto the tunnel sidewalls. They shall be referenced with respect to the theoretical track level as approved by Engineer.

   Given that the precision of the spatial setting of track laid directly on concrete is of the utmost importance, the Contractor shall position the above markings as follows:

a) Levelling

The markings show the track altitude and shall be placed on the tunnel side walls, at a constant height in relation to the theoretical level of the track running surface. They shall be placed at every temporary support frame of track or 5 m, whichever is less.

b) Layout

The markings show the centre line of each track and shall be fitted in the tunnel at every temporary support frame of track or 5 m whichever is less in straight sections, in circular curves and in transition curves.

4. The inner rail for curve and any rail for straight shall first be set out in its absolute position from track setting marks using co-ordinates computed from the alignment geometry, the elevation of the rail shall be checked using a level, the other rail shall be set correctly relative to the first rail.

7.5 Control of Track Works

1. The Contractor shall ensure that critical dimensions for the JMRC project are met. Regular checking should be carried out during the construction stages to ensure that the specified permissible deviations are not exceeded.
2. The Contractor shall ensure that all survey and track siting marks shall be established on Site to required accuracy. He shall also be responsible for each stage of the setting out work and for verifying compliance before construction starts.
3. The Contractor shall develop a detailed Surveyed Track Analysis spread sheet on Microsoft EXCEL. The detailed format of the Surveyed Track Analysis spreadsheet shall be submitted to the Engineer for Acceptance at least one month prior to the commencement of track laying.
4. The surveyed Track Analysis spread sheet shall tabulate against chainage, the vertical difference (high or low) and horizontal difference (left or right) between the actual surveyed track centre line position and the design alignment computed from latest accepted alignment geometry. Derived cant, gauge and twist values shall also be compared against design values on the same spreadsheet.
5. Any out of tolerance condition shall be flagged up on the spreadsheet.

7.6 Survey Instruments

1 Survey instruments used and the methodology adopted shall be appropriate to the intended measurement task and accuracy specifications. Test measurements and instrument calibration shall be carried under local field conditions.

2 It is essential that before starting any initial surveys, and at frequent intervals of not more than three months, all measuring equipment should be tested for their accuracy.

3 All instrument deployed in the Contract shall be in good condition and properly calibrated. Calibration certificates and/or statements of services by local authorised instrument agents of not more than six months shall be the proof that the instruments are in good service conditions.

4 Notwithstanding the above, instruments shall again be checked to ensure good condition before the Contractor proceeds to carry out a critical survey task.

5 Horizontal control traverses shall be carried out with modern precise digital survey instruments consisting of co-axial total station with an accuracy not inferior to 2" arc and (2+2ppmxD)mm. Precise levelling runs shall be carried out in both directions using digital level with an accuracy not inferior to 1.5mm per Km double run. Digital data from the above instrument shall be recorded electronically in the field. For track surveys non co-axial total station shall not be permitted. Total stations used for track surveys shall have onboard software permitting setting out and checking of points along a calculated alignment in the field. Survey instruments used by the Contractor shall meet such standards.

6 For track surveys Track master or its equivalent (to be approved by JMRCL) confirming to international standard will have to be used.

7.7 Quality Plan

The Contractor shall submit to the Engineer, for acceptance a separate quality plan related specifically to survey matters. The plan shall address for following:

- Identification of the Contractor's key survey staff and the lines of communication
- Scope of the surveying section including interface with designated contractors
- List of proposed surveying equipment & computer hard/software;
- List of surveying procedures;
- List of detailed method statements for all critical surveying activities;
- Survey test and inspection plan;
- Control of survey data and records;

CHAPTER 8

MATERIAL AND WORKMANSHIP: INSTALLATION

8.1 Introduction

8.1.1 General

1) The proposed method statements, installation procedures and installation plans for the Works shall be submitted for the Approval of the Engineer in accordance with this Chapter. These submissions shall be summarised and detailed in the Contractor's Submission Schedule (CSS). The documents forming the submissions shall use a standard format which shall be submitted by the Contractor for the approval of the Engineer

2) Notwithstanding the nominal track to supporting structure dimensions indicated on the Drawings, the as constructed dimensions may vary subject to the allowable tolerances. In addition the supporting structure may contain ramps, steps, channels, drains, anchor bolts, manholes, upstands and the like. The methods of construction shall accommodate these constraints

3) All temporary/service tracks, if required for track work on main lines and depot lines, shall be arranged & laid by the contractor with prior approval of the Engineer. The contractor shall remove these temporary/service track after completing the track work as approved by Engineer.

8.1.2 Track forms

1) The ballastless trackform on main lines shall be direct fixation on reinforced concrete slab for plain track and in station area and RCC slab for all turnouts as shown on the Drawings.

2) The ballastless track in depot areas shall be of the following types as shown on the Drawings

   a) Embedded rail,

   b) Discretely supported on steel pedestal,

   c) Ballastless plinth type track form for washable apron (individual pedestal for each rail seat).

8.2 Methods of Working

8.2.1 Method statements

1) Method statements detailing the proposed methods of working and incorporating all temporary works required shall be submitted to Engineer for his approval. No Permanent Work shall commence until the method statements are approved by the Engineer.

2) Method statements for track laying shall, as a minimum cover the following items, where ever applicable:

(a) handling & transport (including for materials to be supplied by Employer)

(b) stacking/storage/accountal / reconciliation of materials (including for the materials to be supplied by the Employer)

(c) pre-assembly/assembly

(d) delivery

(e) surveying

(f) setting out

(g) welding

(h) track installation

(i) concreting

(j) as-constructed records

(k) cleaning

(l) destressing

(m) cutting of rails, which may render generation of unusable small cut pieces.

3) Method statements shall, as a minimum, incorporate hold points, tolerances, finishes required, temporary works, false works, formworks, test and inspection plans and shall include safety and quality control requirements for each activity.

4) Method statements are also required as a minimum for the following production or installation activities:

(a) Each track form

(b) Turnouts, crossovers, scissors cross over and derailing switches

(c) Rail welding

(d) Buffer Stops

(e) Surveying

(f) Tests on Completion

5) Method Statements shall be prepared and submitted in a standard format as described in Clause 8.1.1 with descriptions under the following minimum headings:

(a) Safety

(b) Plant, Equipment & Tools

(c) Construction Method

(d) Protection to existing drainage facilities, cast-in items, etc.

(e) Tolerances & finishes

(f) Hold Points

(g) Proforma/check sheets

(h) Falseworks /Formwork

(i) Temporary Works

(j) Reference Drawings

(k) Reference Documents/Clauses

6) Method Statements shall be itemized and have Document/Clause reference column as the right hand side margin.

7) Each method statement shall be referenced to the relevant clauses of the documents forming the Contract.

8) Method statements which require the use of any specific/specialised equipment or Constructional Plant shall clearly specify the equipment or Constructional Plant and the operator's experience required.

8.3 Final Condition of Track

1) Throughout construction generally and immediately after installation of the track, the rails, rail fastenings, the concrete track base, including ducts, track drains and any exposed support structure shall be made clean. This cleaning shall include the use of air/water pressure jetting and vacuum cleaners as necessary.

2) Once a section has been cleaned, tested and the insulation values accepted by the Engineer, that sections accepted level of cleanliness shall be maintained until the taking over of the section.

8.4 Track Installation

8.4.1 General

1) The track gauge throughout shall be 1435 mm measured between the running edge gauge point of each rail and normal to the centre line of the track 14 mm below top of Rail.

2) All main line and depot line track including turnout, x-over, diamond xing, derailing switches shall be laid with - 1:20 inward rail slope.

3) The Contractor shall take due cognisance of his proposed rail jointing system and the rail fastening assembly spacing in the selection of the appropriate length of long welded rail panels.

4) The minimum closure rail length in plain line shall be 6 metres except for specific locations as shown on the Drawings or as approved by the Engineer.

5) No wastage allowance shall be permitted for the various materials supplied by the Employer except for the rails. The wastage allowance for rails shall be permitted in accordance with the provisions of para 8.4.2. (4) of PS.

8.4.2 Rail Jointing

1) All rail joints throughout the main lines and depot, including turnouts, except at locations approved by the engineer, shall be welded.

2) The welding of nominal rail lengths into long welded rail panels for main lines and depot lines shall be by flash butt welding. Alumino-thermic welding shall only be used in exceptional circumstances with prior approval of the Engineer. Temporary joints between HH rails shall be by fish plates & clamps without drilling of holes in rails.

3) All the welded joint for welding less than 18m rail length on main lines and 13m rail length on depot line shall have prior approval of Engineer.

4) The contractor shall obtain Engineer's prior approval for any rail cutting, which may render generation of unusable small cut pieces. These cut pieces shall also be properly accounted, collected and stacked in Mansarover Depot at a place approved by the Engineer before its handing over in acceptable condition.

8.4.3 Locations of Welds

The spacing of welds and joints shall not be less than 6.0 m between any two welds and for any deviation to this, specific approval of Engineer shall be required in each case.

8.4.4 Long Welded Rails

Long welded rail panels (LWR) shall generally be a minimum of about 144 m. Shorter panels shall only be permitted when dictated by site conditions/site constraints and as Approved by the Engineer.

8.4.5 Fish plated Rail Joints

1) Standard fish plated joints wherever required in plain track shall be square.

2) Standard fish plated joints shall be installed centrally between two adjacent fastenings and shall be manufactured and installed to permit the use of standard rail fastening assemblies.

3) All fish plated joints shall be fitted with the nuts on the inside of the track.

8.4.6 Glued Insulated Rail Joints

1) All glued insulated rail joints shall be shop manufactured using minimum 6 m long rails. Site fabricated glued insulated joints shall be provided with prior approval of the Engineer,

2) Except in the case of glued insulated joints in the turnout zone, the positioning of the glued insulated joint with respect to the approach track (adjoining track) shall be such as to keep a minimum distance of 4.00 m from an existing weld in the rail.

8.4.7 Rail Temperature

Rail temperatures shall be measured using appropriate dial type magnetic rail thermometers placed on the web of the rail on the shaded side. A minimum no of thermometers required to be used per rail for measuring average rail temperature of a segment of track shall have the prior approval of Engineer.

8.4.8 Cutting of Rails

1. Rails shall only be cut by using rail cutting machines. The proposed method and equipment for the cutting of rails shall have the prior approval of the Engineer.
2. Rails required to be cut shall be cold sawn square and vertical across the rail. A deviation from square or vertical of more than 0.50 mm, measured about the rail head, shall not be permitted. All burrs shall be removed from the rail ends.
3. Quality of cutting shall be such as to ensure tolerances in flash butt and alumino–thermic welding manual.

8.4.9 Drilling of Rails

1. All fish bolt holes in rails, wherever required shall be drilled by using proper jigs and drilling machines. The proposed method and equipment for the drilling of rails shall have the prior approval of Engineer
2. All holes in the rails shall be chamfered using chamfering kit & procedure approved by the Engineer.

8.5 DELETED

8.6 Ballastless Track Installation

8.6.1 General

1) The components of ballastless system shall be:
    a) support structure
    b) shear connector
    c) reinforced concrete plinth for plain track & turnouts
    d) fastening system 336 as shown in relevant drawings.
2) A "Request for Inspection" shall be submitted to the Engineer, complete with all necessary information to allow assessment, after the following activities and Approval must be received prior to the commencement of any follow-on activity:
    a) Acceptance of support structure including specified surface treatment,
    b) Acceptance of shear connector during CW structure acceptance by Track Contractor.
    c) Acceptance of the plinth/slab reinforcement,
    d) Acceptance of the track for jigs, fixtures, supporting arrangement & concreting,

e) Acceptance of the track for the movement of construction plant, equipment and machinery,
f) Acceptance of the track for in situ welding,
g) Acceptance of the track for de-stressing.

8.6.2 Reinforced Concrete Plinth:

1) The surface of tunnel lining/1st pour concrete shall be surveyed to achieve the minimum depth (185 mm) of plinth below the rail seats. For such of those locations where minimum depth of 185 mm is not achievable, the contractor shall, with complete details, seek engineer's decision.

2) The reinforced concrete plinth shall be connected with 1st pour concrete/precast concrete through shear connectors as shown in drawings. The contractor shall ensure that these shear connectors are in position before concreting the plinth. Wherever these shear connectors have not already been provided, the contractor shall provide the same by drilling & epoxying in 1st pour concrete/support concrete as shown in drawings and as directed/approved by Engineer.

3) The contractor shall prepare the surface of supporting structure for laying of plinth/RCC slab by its scrabbling for proper bonding as approved by engineer.

4) The Ballastless track shall be constructed by top down method of construction. The laying tolerances for various track parameters for the as installed track shall be strictly achieved in accordance with the clause 8.12.2. For achieving these tolerances, the contractor may propose an alternative method/scheme of construction of ballastless track along with tender submissions, if he so desires for Employer's consideration. However the sole responsibility of achieving the stipulated track laying tolerances lies with the contractor. The tenderer shall submit the detailed construction methodology including the method of handling and transport of material with the details of temporary works, equipment, plant and machinery, as to the locations where such method/Scheme has been used for similar project/conditions to demonstrate its provenness. If the alternative method/ scheme as proposed by the tenderer is accepted by Employer, the contractor shall ensure that same scheme is adopted for construction of ballastless track on the project. If the alternative method/ scheme as proposed by tenderer is not accepted by the Employer, the contractor shall adopt the top down method for the construction of ballastless track.

5) The contractor shall be responsible to workout the actual height of plinth at each location to maintain the designed rail level as shown in the relevant drawings and submit the same along with all relevant details for the approval of the Engineer. The reinforced concrete plinth shall be laid in the tunnel on the viaduct duly making the required provision for cant & vertical curve for all heights worked out above. The indicative values of cant adopted for horizontal curves have been shown in Volume IV Track Drawings. However the exact

values of cant for all the horizontal curves shall have to be obtained/interfaced by the Contractor with the designated civil Contractors with prior approval of the Engineer.

6) The reinforced concrete plinths shall normally be laid in continuous lengths on the overall length of viaduct spans.

7) During the concreting phase, the track fastening device and the running rails shall be protected by movable covers against possible splattering of concrete.

8) Each plinth unit shall be built in one single operation; the pouring of the concrete shall imperatively be completed in one go.

9) Twenty-four hours after pouring the plinth concrete, the formwork may be removed.

10) In case of top down method, the plinth construction shall be carried out by using perforated dummy plates of appropriate thickness as approved by the engineer, which shall later be replaced by intermediate pad and elastomeric pad after the concrete attains sufficient strength.

11) The Concreted surfaces of the plinth below the base plates shall be smooth, devoid of any inclusion, roughness crack, and without showing any aggregate at the surface.

12) The presence of smooth cavities caused by air bubbles in excess of the value mentioned below shall not be tolerated in case of top down construction method.
    - Total surface area of the cavities: 10,000 mm^2 on base plate area
    - Maximum dimensions of the inscribing rectangle of a cavity: 20x30 mm,
    - Maximum defect depth 5 mm

8.6.3 Deleted

8.6.4 Deleted

8.6.5 Drainage

The contractor shall be responsible for provision of longitudinal & cross drainage within ballastless track form (in station areas and on turnouts) with regards to main drainage system duly interfacing with the designated civil contractors. The main drainage system shall be provided by designated civil contractors. The contractor shall submit the scheme of proposed track drainage for each location for the approval of the Engineer.

8.7 Turnouts, Crossovers, Diamond Crossings (Ballastless Track)

8.7.1 General

1) Turnouts on ballastless track shall be so set out that the line and level of both straight and turnout track are within designed tolerances as approved by Engineer.

2) Check rails shall be set and checked to the correct clearance by using the running edge of the crossing as the datum.

3) The assembly sequence of turnouts and diamond crossings shall be submitted for Engineer's Approval as part of the overall method statement for pre-assembly, handling, storage, transportation, unloading and installation.

4) On completion of a turnout, the Contractor shall immediately scotch the switches with a purpose made hardwood timber scotch and securely clamp the switches for the through route with an appropriate clamp to be arranged by the contractor and as approved by the Engineer. The clamp shall be capable of being padlocked with the switch in the closed position.

5) No on-track Constructional Plant, equipment and machinery shall be allowed to operate over a turnout until it has been inspected and approved by the Engineer.

6) The contractor shall interface & ensure the designed switch opening while fixation of the first stretcher bar by designated signalling contractor.

7) All stretcher bars for switches except first stretcher bar shall be installed by the Contractor duly interfacing with designated signalling contractor and approved by the Engineer.

8) Switches shall be installed to provide adequate flange way clearance between the stock rail and the switch rail with the switch rail in open position. The minimum flange way clearance in switch portion shall not be less than 60 mm. For this purpose 1 in 9 turnout may have 2nd drive arrangement. The contractor shall provide arrangements for mounting of point operating mechanism and 2nd drive and shall co-ordinate and interface with designated signalling contractor to ensure full compatibility with regards to installation requirements and point operating mechanism. The contractor shall also be responsible for fixation of 2nd drive on tongue rails and RCC slab. The opening of switch at toe of switch shall be kept as 160 mm.

9) The contractor shall provide all gauges and measuring equipment and labour necessary to completely check the pre assembled turnouts crossovers and diamond crossings.

8.7.2 Installation (Ballastless)

Installation of ballastless turnouts, crossovers, and diamond crossings on RCC slab shall be done observing the provision of clause 8.6.2.

The turnouts, x-overs and diamond xing shall be installed without dummy plates, instead galvanised steel plates of appropriate thickness and dimensions shall be supplied & provided below the intermediate pad on all base plates by the contractor at the time of assembling these for installation. Concreting shall be done up to 15-20 mm below bottom of these plates and the gap shall be grouted with an appropriate material as approved by the engineer.

8.8 Mass Spring System

8.8.1 In Tunnel

MSS reduces structure borne vibration and secondary airborne noise; therefore, it is to be provided in the area where these noise and vibrations can be controlled. MSS of world proven design can be considered subject to proper technical evaluation and approval by JMRC.

8.8.2 Performance criteria of MSS for Ballastless Track on Metro Railways/MRTS System

The objective of this document is to establish the requirements for the supply & installation of a full surface Mass spring system for optimal vibration isolation.

8.8.3 General Requirements to the Quality of the Mat/Elastic Pad of Mass Spring System

a) It should be full-surface support for the slab.

b) The surface of the pad should be free from cracks & damages that affect the performance of the pad.

c) The elastic pad should be reliable, homogeneous and having lasting elasticity

d) It should have homogeneous stiffness distribution.

e) It should not be hygroscopic as it may cause a loss of their mechanical stiffness

f) It should be possible to overload the elastic pad for short term without deterioration and it should not damage when heavy vehicle is driven over it.

g) It should have high efficiency & should provide long term stability

h) It should be designed & installed so that no maintenance is required during lifetime of the track.

i) The elasticity of the pad must be based on the compressibility of the material & not on the shape of the product structure

j) Any geometrical forms like dimples or notches on the material surface must be avoided as this might influence the elasticity of the material in a negative manner due to sediments or dust.

k) Use of softening agents/ plasticizers may be avoided in pad material as diffusion of same may stiffer the system.

l) The elastic pad may be previously cut into special sizes to ensure a rapid & optimal installation.

m) The elastic pad must resist the following environment al factors:

- Presence of environmental chemical agents including acid rain, oxidation & alkaline fluids.
- Lubricants in general
- Presence of biological agents.
- Ultra-violet rays (ozone).
- Affluent from tunnel leakages

n) MSS shall be with a proven track record. MSS should have satisfactory performance record of minimum 5 years in service in ballastless track on two operational metro systems and or mainline railways for minimum 15 ton axle load on a similar fastening system for a minimum speed of 80 kmph giving information about natural frequency , insertion loss in relevant frequency range (40 Hz) & rail deflection of system where it was installed. In this regard supplier should submit certificate of performance from user metro and or mainline railway administration including proof of usage of MSS.

o) MSS shall have design service life of 35 years.

p) The elastic pads should be volume compressible.

q) It is to be labelled at the manufacturer's premises indicating the manufacturer and year of manufacturing

8.8.4 Design

Drainage: A proper drainage system is to be designed for the proposed Mass Spring System by the designing authority.

Structural design of the MSS slab: As the MSS slab is a floating slab, the proper structural design of the slab including reinforcement should be done by the design authority to ensure a sustainable service life.

The structural design of the MSS slab shall include Ultimate Limit State, Serviceability Limit State and Fatigue Design according to relevant codes for concrete structures (e. g Euro code 1992 or similar).

8.8.5 The contractor should submit the following to the Engineer for approval

a. Detailed specification of the elastic pad including *size,* to be laid between the 1st and 2nd pour of concrete.

b. Detailed calculation of natural frequency, transmission function, insertion loss & rail deflection based on 2 mass 2 spring model.

c. Method statement for laying & installation of MSS material.
d. Design of the transition zone such that increase or decrease in the stiffness of track system is limited to 50% & method statement for laying & installation for the same.
e. Certificates of tests carried out earlier on MSS material as per the relevant standards and also furnish the copy of those standards.
f. Method statement for testing of the system after completing the installation & maintenance manual.
g. Quality Assurance Plan.
h. Performance report as stated in para. 8.8.3 above.

8.8.6 The contractor is required to ensure the following for the MSS

a) MSS shall be installed duly keeping the drainage in view.

b) The elastic pad should be fixed with proper arrangement so that during 2nd stage concreting, there should not be any movement of pad from its desired position.

c) The static and dynamic stiffness of the elastic pad must be evaluated in order to achieve the performance of MSS in terms of natural frequency, transmissibility, insertion loss and rail deflection and further to determine the acceptance criteria of the elastic pad at the time of testing.

d) Design requirements for mitigation performance should achieve natural frequency < 20 Hz and insertion losses of at least 10 dB in the relevant frequency band of 40 Hz.

e) Calculation of MSS should be based on actual drawings submitted during tender for circular and cut & cover tunnel.

f) Total rain deflection due to running train (for slab + fastening) to be limited to 4 mm.

g) Thickness of MSS mat (to be provided in single layer only) normally should not exceed 25 mm.

h) Elastic pad design and installation should be such that it does not permit dirt or cement slurry from slab track to seep into the elastic pad, thereby affecting the life and performance of the MSS.

i) It is important to keep the number of joints as low as possible and joints shall be sealed with tape to prevent the concrete mixture from entering & creating structure borne sound bridges.

j) The resilient mat installation must be completed in the full width and length of the track substructure and on the vertical sides in order to obtain a truly floating concrete slab.

k) The installation has to be done under strict supervision of the MSS material supplier and in accordance with the installation guidelines given by the supplier. The concreting of the slab has to be done only after the clearance from the supplier's inspection supervisor.

l) If there are shear keys, a full decoupling of the shear key from the floating slab shall be achieved by covering the shear key with the elastic pad.

8.8.7 Acceptance values of tests

SN	Test (DIN 45673-7)	Value
1	Vertical static bedding modulus And at-rest value of Vertical static bedding modulus	Vertical static bedding modulus $C_{stat,required} \geq 0.8\ C_{stat\ calculation}$ $C_{stat} = \frac{\sigma_1 - \sigma_o}{S_1 - S_o}\ [N/mm^3]$ σo = minimum load (dead weigh(of the track slab) σ1 operating load (dead weight and the actual operating load) S_o = measured deflection corresponding to σo S_1 = measured deflection corresponding to σ1
2	Horizontal static bedding modulus	Shear Modulus G_{stat}, required $\leq$ 0.12 N/mm^2
3	Vertical dynamic bedding modulus	• Dynamic to static bedding modulus ratio (with dead load of the slab only) < 1.8 • C_{dyn} calculation (fo, σ_1) / C_{dyn}, calculation (30 Hz σo)< 1.0 • Cdyn, reguired <1.2 x Cdyn, calculalion (fo,σ1) [N/mm3] • With Cdyn, calculation (fo, σ1), the natural frequency shall be within 17 Hz - 20 Hz
4	Loss factor, η	0.05 < η≤ 0.5
5	Dimensional check (as per ISO 3302 -1 : 1999(E))	For 25 mm thick material : 25 mm + 1.6 mm For 12.5 mm thick material : 12.5 + 1 mm
6	Raw Material review	
7	Appearance check	
8	Material identification test	As per DIN 45673-7: 2010
9	Water absorption capacity	% by Volume< 70 % & % by Mass< 300 %
10	Water resistance	Avg. Tensile strength & elongation not to deviate by more than 15%
11	Ageing resistance	Change in mass: <3% Increase in stiffness: < 10% Compression set: < 30%
12	Mechanical fatigue strength	Change in static stiffness/static bedding modulus after test should be below 20% for 3 million load cycles as per DIN 45673-7
13	Tensile stress at break (as per DIN EN ISO 527-3/5/100)	0.4 N/mm2
14	Elongation at break (as per DIN EN ISO 527-3/5/100)	250%
15	Compression set (as per EN ISO 1856)	<5% (50 % deformation, 23oC, 70 Hrs, 30 minutes after unloading)
16	Test after installation	Change in natural frequency of concrete slab only should not be more than 10%

Note: Tests on the material as mentioned in point no. 8.8.2.1, 8.8.4, 8.8.5 & 8.8.6 from the above table need to be done in presence of an independent inspection agency (one

sample every 1000m^2 of material). For test no. 8.8.3, the testing to be done for every lot dispatched and the report shall be offered to Third Party Inspection agency for their review.

Other tests which are type tests, the testing to be done once for the contract quantity and the reports shall be offered to the Third Party inspection agency for their review.

8.8.8 Calculation for the Prognosis of the Proposed Mass Spring System

The following parameters have to be used when calculating the natural frequency and the insertion loss of the system (Prediction):

- Unsprung mass: max. 15% of the wheel-set mass
- Weight of the slab and the fastening system
- Theoretical Model: 2 mass 2 spring system approach
- Total stiffness of the theoretical model includes vertical $C_{dyn\ calculation}$ (f_0 σ_1) of full surface bearing underneath the slab and horizontal $C_{dyn\ calculation}$ (f_0,σ_o) of the side mats

Output of the calculation should clearly show

- Natural frequency of the whole system
- Dynamic bedding modulus of material at the operating load levels of running train and at the natural frequency
- Deflection of rail at operating speed (load levels to be considered: mass of superstructure plus mass of train and considering the effect of elastic rail fastening system)
- Static bedding modulus between load range of minimum load and operating load
- If systems are calculated as 2 mass 2 spring system, the output shall be natural frequencies and the dynamic interaction (transfer function and insertion loss over the whole frequency range)

Acceptance criteria: For full Surface Mass Spring System, natural frequency of the whole system should be less than 20 H_z, total rail deflection (for slab + fastening) to be limited to 4 mm and insertion loss to be minimum 10 dB in the relevant frequency band of 40 H_z.

8.9 Destressing of CWR

8.9.1 General

1) The de-stressing of rails shall not be undertaken until it has been demonstrated to the Engineer's satisfaction that the track has been completed to the specified standard & specification and the method of working for de-stressing of the relevant track form has been approved by the Engineer.

2) The final welding of joints within turnouts shall be undertaken as per sequence as approved by Engineer and within the stress free temperature range.

3) The elementary long welded rail shall be laid on rollers placed on the metal base plates or sleeper rail table, with the rollers at maximum 6.00-m intervals. In any case, rollers shall have suitable diameter to avoid contact between rail and intermediate sleepers/metal base plates.

4) After placing the long welded rail on rollers, it shall be stress relieved by hitting the rail on each side of the head with wooden mallots as approved by Engineer.

5) For de-stressing of CWR, guidance may be taken from LWR manual of Indian Railways.

6) The rails for continuously welded track shall be de-stressed in accordance with temperature conditions as per Clause 2.2.4.

8.9.2 Buffer stops

1) The installation details for friction buffers stops shall be submitted by contractor as per manufacturer's guideline for Engineer's approval.

2) Friction buffer stops shall not be installed until the track is at the design line and level, as approved. The following requirements shall be complied with:

- There shall be no thermic weld within the rail length of the buffer stop or the rail sliding length of the buffer. Any weld that fall within the friction buffer stop rail sliding length shall be ground to produce a smooth and uniform standard rail cross section to ensure that the performance of the buffer stop is unaffected.
- Friction buffer stops shall be assembled and installed with the sliding shoe bolts torqued strictly in accordance with the manufactures instructions.

8.10 Rail Welding

8.10.1 General

1) All main lines and depot lines shall be welded into a LWR by flash butt welding process except at location as approved by the Engineer. Alumino-thermic

welding shall only be permitted in exceptional circumstances when dictated by site conditions/ constraints and as approved by the Engineer.

2) The welding process shall be suitable for UIC60 rail sections of rail grades IRS-T-12-2009 1080 grade head hardened.

3) Weld records of all welds shall be submitted at intervals not exceeding 1 km of rail welded into long lengths. The proforma for the weld records plan shall be submitted by contractor for Engineer's approval. This record shall contain, as a minimum, the following information:

   (a) Weld chainage to the nearest metre,

   (b) Weld number,

   (c) The rail grade and section,

   (d) Date welded,

   (e) Weld test record sheet reference (if different to the weld number),

   (f) USFD test results

   (g) Dimensional check results

4) Arrangements shall be made to have test welds and their testing for proving of the flash butt welding technique, the alumino-thermic weld process and competence of welders deployed for welding work.

5) The welds shall be finished to final profile by controlled profile grinding as approved by Engineer. The finished weld alignment shall be as per specified tolerances. Railhead profile grinding to produce the finished alignment shall not extend more than 300mm either side of the weld.

6) All welds shall be marked as per the provisions of the relevant welding manuals as mentioned in clause 5.3 (9).

8.10.2 Flash-butt welding

8.10.2.1 General

1) The Flash Butt Welding of rail joints shall be undertaken in accordance with the relevant Indian Railway Manual for Flash Butt Welding of rail as mentioned in clause 5.3(9). And as supplemented in this section.

2) For 1080 grade HH rails, the minimum breaking load and minimum deflection as mentioned in the relevant clause of Indian Railway manual for flash butt weld shall be such that the weld shall not show any sign of cracking up to the specified rail deflection and the load at this deflection shall be more than specified minimum breaking load. The values of specified deflection and specified minimum breaking load shall be as mentioned in the Indian Railway manual for flash butt weld 1998.

3 samples of flash butt weld shall be got tested for fatigue test in laboratory approved by the engineer. The test scheme and arrangements should have prior approval of the engineer.

3) Rails outside the required end straightness tolerance shall not be welded. Rail ends that are out of tolerance for straightness after welding may be straightened by the use of a purpose made rail end straightener as approved by Engineer and cause no damage/indentation to the rails, Alternatively the rail ends may be cut and rewelded, in which case the payment of such weld shall not be made to the contractor and the cost of associated rail length shall be recovered from the contractor.

8.10.2.2 Welder qualification

All flash-butt welding machine operators shall be trained and certified either by the manufacturer of the machine or by an independent Institution as approved by the Engineer

8.10.2.3 Flash-butt welding quality control

Depending upon the cause of any defective weld it may be necessary to test sample welds from the previous shift production run as directed by the Engineer. The necessary tests, as instructed by the Engineer, shall be at the Contractors expense. If any of these welds fails in testing, welding shall immediately stop until the cause is identified and rectified. After rectification it shall be demonstrated by the Contractor to the Engineer that all similarly affected welds have been removed from the track.

8.10.2.4 Flash-butt welding plant

1) The flash-butt welding machine shall be mobile type (**road cum rail**) capable of welding even in situ welds.

2) The welding clamps of rail shall provide contact area along the entire web of rail and shall be fitted with spring-loaded balls for optimum alignment of rail ends.

3) The welding head shall be equipped with an integrated shearing device for shearing of the weld seam automatically, immediately after the welding process has been finished suitable for UIC 60 IRS-T-12-2009, 1080 HH grade.

4) A recorder system shall be provided for the simultaneous recording of butting pressure, upset, and magnitude of current and duration of welding.

8.10.3 Alumino-thermic welds

8.10.3.1 General

1) An Approved alumino-thermic short preheat welding process as per Indian Railway manuals shall be used for the welding of joints. The weld shall be

undertaken in accordance with the relevant technical specification for approval of a process and portions supply for thermit welding of rails and relevant technical specification for performance and acceptance of thermit welding of rails of Indian Railways as mentioned in clause 5.3(9).

2) Where rails of dissimilar rail steel grade are to be welded together the weld portion to be used shall be that of the higher-grade rail.

8.10.3.2 Qualification of welders for alumino-thermic welds

All alumino-thermic welders shall have competency certificate issued by manufacturer of the approved welding process or by an independent institution as approved by the Engineer.

8.11 Permanent Markers

8.11.1 General

1) As the track is completed permanent markers shall be provided and installed as follows:

   (a) Kilometre markers,

   (b) Change of gradient markers,

   (c) Curve (Vertical & Horizontal) Reference markers,

   (d) LWR/CWR reference markers

   (e) Fouling point markers,

   (f) Turnout markers.

2) All permanent marker plates/boards shall be of high intensity retro-reflective micro prismatic and confirming to ASTM-4956. Size of permanent marker boards, colour scheme and fixation arrangement proposed to be used shall have prior approval of Engineer.

3) All information to be marked on the markers and its location with chainage shall be submitted by the contractor for Engineer's approval

4) All markers required to be painted on rail for curves (**Vertical & Horizontal**) and turnouts etc. shall be paint marked by the contractor. The scheme for which shall be submitted by the contractor for Engineer's approval.

8.12 Track Tolerances

8.12.1 General

1) The track parameters of completed track work shall be measured by contractor in the presence of the Engineer and the measurement recorded shall be in a format approved by the Engineer and submitted both in hard and electronic copy.

2) The variations in horizontal alignment, vertical alignment versines, cross level/cant, twist and gauge shall not exhibit cyclic patterns.

3) All the track parameter measurements shall be taken in the unloaded condition of the track. The base of measurement shall be as below:

- Each sleeper or base plate for the gauge,
- 3.5 metres for the cant, cross-level and twist,
- 20 metres (half overlapping) for lining and
- 10 metres (half overlapping) for vertical profile

4) The contractor shall be solely responsible for achieving track tolerances stipulated in clause 8.12.2 with the materials supplied by the contractor and the Employer as per contract.

8.12.2 Dimensional tolerances

1. Track tolerances shall comply with the following limits:

a) Gauge (with reference to 1435 mm)

- Maximum variation over the prescribed track gauge

  Ballastless track : -1 mm , +2mm

  Ballasted track : ±2mm
- Maximum variation in track gauge 1mm /sleeper or base plate

b) Maximum difference of any point in relation to the designed layout (vertical)

Ballastless track : -4mm/+4mm

Ballasted track : -20mm/+20mm

c) Difference of any point in relation to the designed layout (horizontal)

- Straight

  Ballastless track : +/-4 mm

  Ballasted track : +/- 10mm -
- On straight and curve, deviation of measured versine over its designed value on a 20 m chord: (half overlapping)

  Ballastless = ± 2 mm

  Ballasted = ± 5 mm

d) On constant grade and vertical curves,

Maximum deviation of measured versine (vertical) over its designed value on a 10 m chord (half overlapping)

i) Ballastless +/- 2mm

ii) Ballasted +/- 2 mm

e) Cant/Cross Level (to be measured at every 3.5 m)

i) Straight track and curved track (ballasted) ± 3mm
(ballastless) ± 2mm
(Deviation from designed value)

ii) Base plate to base plate (ballastless)
variation of cant/x-level ± 1 mm

f) Twist: maximum value on a base of 3.5 m (ballasted and ballastless)

- Straight and circular portion of curve = 1mm/m
- On transition portion of curve (over & above designed value) = 0.5mm/m

g) Turnouts (ballasted and ballastless)

- Stock rail joint (longitudinal location) +/-15mm
- Nose to nose of Xing in crossovers (ballastless & ballasted) ±10mm
- Flange way clearance at end of the switch planning +5mm/-0mm
- Switch toe opening +1mm -0mm
- Switch toe squareness 5 mm
Deviation of measured versine over its designed value for switches, lead track (measured on 6 metre half overlapping chord) +/- 2mm

h) Sleeper/Base plate

- Spacing +/- 10mm -
- Sleeper/base plate/ perpendicularity to rail centre line(out of square) 5mm

i) Rail joint squareness across the track

- (fish plated) 10mm

8.12.3 Methods of measuring and recording

(1) The completed track geometry shall be measured for the following track parameters as a minimum:

(a) Gauge
(b) Horizontal Alignment (Versine) of minimum one rail
(c) Cross Level/Cant
(d) Twist
(e) Vertical unevenness (Right hand rail)
(f) Vertical unevenness (Left hand rail)

(2) The proforma for the measurement of track parameter submitted by contractor for Engineer's approved shall consist of the following as a minimum:

a) A common base point for recording of location
b) Cross level/cant
c) Gauge
d) Horizontal alignment (versine)
e) Vertical unevenness both for right & left rail.

(3) The proforma shall show the design figure, actual figure and the difference between design and actual and shall allow columns for marking of twist.

(4) The horizontal versine shall be measured every 10 m (half chord point) using a 20m chord and moving forward at 10 m intervals. The versines shall be measured on the non gauge face of the inner rail in curves and either rail of straight tracks at points 14mm below top of rails. Where a recording changes its measuring rail there shall be a minimum overlap of readings of 60 meters.

(5) The as-built recordings of rail level and horizontal alignment along longitudinal direction with respect to the designed level & alignment shall be obtained by the use of appropriate electronic survey instruments as directed by the Engineer. Horizontal location readings shall be presented as co-ordinates. Deviation from designed co-ordinates shall also be shown.

(6) The vertical and horizontal rail location readings shall be taken at coincidental kilometrages.

(7) The recordings of rail level and horizontal location shall be taken at the intervals as proposed by the Contractor and Approved by the Engineer.

(8) Longitudinal locations shall additionally include, but not be limited to, switch and crossings locations.

(9) Rail inclination shall be measured using a purpose made digital rail inclinometer and the recordings shall be submitted by contractor for the Engineer's approval.

8.13 Records

The manual records of rail level, cross-level/cant, gauge, twist, versine along longitudinal location and horizontal alignment with reference to the designed locations shall be presented both electronically and in hardcopy.

CHAPTER 9

MATERIAL AND WORKMANSHIP: TESTING AND INSPECTION

9.1 General (For the materials to be supplied by the contractor)

9.1.1 Laboratory testing

(a) All materials, components and assemblies shall, unless otherwise noted, be inspected & tested by an Approved independent inspecting agency as approved by Engineer on case-to-case basis to demonstrate that they satisfy the Employer's requirements, when tested in accordance with the specified procedures. Where no procedure is specified, the Contractor shall propose suitable standard or particular procedures for Engineer's Approval.

9.1.2 Quality Assurance

1. All materials, components or assemblies shall be tested and inspected at the frequency stated within the present Specification.
2. A comprehensive schedule of all material inspection/tests at the required/specified frequency of testing shall be submitted by the Contractor for engineer's approval.
3. A sample Proforma, with typical examples, for the material inspections/tests shall be submitted by the Contractor for Engineer's approval.
4. On receiving Approval of the material inspection/test schedule, the Contractor shall follow the schedule to prepare the required individual test and inspection plans and submit for Engineer's approval.
5. Such of those tests and inspections, for which Engineer has opined to witness, shall be carried out only in the presence of Engineer. For other tests & inspections test/inspection results and certification thereof shall be submitted as directed by Engineer for his approval. However, Engineer may at his discretion conduct test checks to be organised by contractor for validation of test/inspection results. The expense of such tests shall be borne by the Contractor.
6. Suitable Proforma for the recording and witnessing of all tests and inspections shall be submitted for Engineer's Approval. Confirmation of date of a test or inspection shall be presented on an Approved Proforma, not less than 21 Days prior to the date for test / inspection.
7. No material, component or assembly shall be shipped until the clearance for this has been obtained from the Engineer.
8. Should the items to be tested or inspected fail to meet the requirements of this Specification, necessitating additional visits to the laboratories or works for retesting or inspection the costs of these additional visits shall be at the expense of the Contractor.

9. Periodically, during the Contract the Engineer may conduct inspections of manufacturing activities at the premises of the Contractor and those of his suppliers and subcontractors. Such inspections shall include quality procedure checks, witness inspections, both routine and prototype, and shall also be for the purpose of monitoring progress. During each inspection suitably qualified staff shall be provided by the Contractor.

9.2 Material and components supplied by the contractor

All material and components supplied by the contractor shall be inspected and tested in accordance with the relevant technical specification of Indian Railways as mentioned in clause 5.3(9).

9.2.1 Welding

General

1) All Welds (Flash butt and alumino-thermic) shall be tested ultrasonically as per relevant Manual for Ultrasonic testing of rails and welds as mentioned in clause 5.3(9).

2) All the defective welds whether identified as a result of USFD testing or otherwise shall be removed from the track and rewelded by the contractor. The cost of all the rewelding of the defective/rejected welds and that of associated rail length including cutting of rails, adjustments and all related works shall be borne by the contractor.

9.2.1.1 Welding materials

Welding materials for Alumino-Thermic welding shall be tested in accordance with the relevant technical specification for approval of a process and portion supply for thermit welding of rails if Indian Railways as mentioned in clause 5.3(9).

9.2.1.2 Flash-butt weld tests

Tests for Flash-Butt Welding shall be carried out in accordance with the Indian Railways Manual for Flash Butt Welding of Rails as mentioned in clause 5.3(9) and as detailed in clause 8.9.2.1 of PS.

9.2.1.3 Alumino-thermic weld tests

Tests for Alumino-thermic Welding shall be carried out in accordance with the Indian Railways Manual for Alumino-thermic Welding of Rails as mentioned in clause 5.3(9).

9.3 Switches and Crossings

9.3.1 Switch inspection & crossing inspection (installation tests)

1. Switches with fixed heel shall be checked as full sets. Running edge offsets and gauge shall be checked at coincidental locations, on both the main and turnout track.

2. Running edge offsets shall be taken at maximum 1000 mm intervals. Running edge offsets shall be within +2mm/ - 1 mm of their design value.
3. The inspection of switches and derailing switches shall include, but not be limited to, the following:
   (a) The switch rail evenly butts with the stock rail throughout the length of the switch planing with the switch lying naturally.
   (b) The underside of the switches and stock rails bear evenly on all slide base plates.
   (c) All dimensional checks of opening of switch, gauge, alignment, cross level offset, lead, check and wing rail clearances nose to nose and flangeways are within tolerance.
   (d) The switch rails over their free length are not twisted/bent.
4. The switch toes shall not be out of square/beyond specified tolerances.
5. Crossings shall bear evenly on all base plates.

9.4 Buffer Stops

1. The fabricated buffer stops shall be inspected by the Engineer before installation. Necessary assistance shall be provided by contractor to facilitate the inspections. A minimum of 21 days notice in writing of the dates on which the buffer stops will be available for inspection shall be given to the Engineer.
2. The buffer stops shall have the identification plates fixed, prior to the inspection, and these identification plates shall be maintained until the acceptance of the buffer stops in the Works.
3. Inspection sheets shall be prepared and submitted for Approval of each assembly clearly showing the design and actual dimensional checks, item number and identification marks.

9.5 Tests on Completion

9.5.1 General

1. Tests on Completion are to be undertaken in accordance with the provisions of Clause 8.4 of General Specification. The Tests on Completion are deemed to include the submission and Approval of all of the documentation identified therein and in the specified format.

9.5.2 Submissions

Before any Section of the Works is accepted as complete the following information shall have been submitted for the approval of the Engineer:

(a) Records and certification for all the tests and inspections identified in PS.

(b) As-built records/drawings of the following in five sets:

- Vertical Alignment
- Horizontal alignment
- Recording unit traces of versine, gauge, twist, cant/crosslevel and rail top longitudinal profiles
- Weld record plan
- All weld test results as detailed in this section, destressing records
- Distance in kilometres, co-ordinates, offsets of all permanent track markers
- Rail Inclination records

(c) The results and reports of all tests and materials, assemblies and items/components.

(d) The results of all Tests shall be submitted in hard copy and electronic format in accordance with Clause 5.1(4) of PS.

9.5.3 Rail insulation to earth test

1. All track work shall be subjected to a rail insulation to earth test. The track shall have a minimum rail-to-earth value of 10 ohms/km of single track for ballastless tracks in worst weather conditions.
2. The rail to earth test shall be undertaken after the track has been completed and cleaned but before it is finally formed into a continuously welded system and before all the bonding is installed.
3. The test shall be undertaken on rail lengths up to maximum length of 1000 m.
4. The track shall not be finally formed into a continuous length, until the rail insulation to earth tests have been undertaken and approved.

9.5.4 Rail to Rail insulation test

9.5.4.1 Ballast resistance test

1. A ballast resistance test shall be undertaken on all track lengths over 50 metres as a check of the leakage of current through the track base and rail fastening system from one rail to the other.
2. The ballasted track base resistance test shall be undertaken after the track has been complete and cleaned but before it is finally formed into a continuous length and all the bonds are attached.
3. The testing procedure and the minimum resistance shall comply with the requirements proposed by interfacing with designated Signalling contractors and as approved by Engineer.

9.5.4.2 Ballastless Track base resistance test

1. A ballastless track base test shall be undertaken on all track lengths over 50 metres as a check of the leakage of current through the track base and rail fastening system from one rail to the other.
2. The ballastless track base resistance test shall be undertaken after the track has been complete and cleaned but before it is finally formed into a continuous length and all the bonds are attached.
3. The testing procedure and the minimum resistance shall comply with the requirements proposed by interfacing with designated Signalling contractors.

9.5.5 Rail inclination inspection

1. Both rails of all ballastless running line tracks shall be checked, at maximum 10 m intervals, for inclination using a purpose made Approved digital inclinometer in the presence of the Engineer.
2. Should any reading show the inclination to be outside the specified limits every alternate fastening assembly shall be further checked either side of the non-compliant reading until compliant readings are consistently obtained.
3. If the length of rail outside the specified inclination exceeds 9 m, the out of tolerance lengths shall be rectified by the Contractor by an method approved by the Engineer.

9.5.6 The procedure / values mentioned in Para 9.5.3, 9.5.4.1 & 9.5.4.2 are indicative and these tests are to be carried out by the designated contractors. The actual values / procedure of these tests shall be interfaced by the contractor with the designated Contractors.

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Section 6 – Employer's Requirement (ERQ)

(Particular Specifications)

Annexure – 1

TECHNICAL SPECIFICATION FOR LAYING OF CONCRETE AND REINFORCEMENT

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SECTION – 1

GENERAL

1.1 General:

1.1.1 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 shall bear no costs of materials, labour, equipment, duties, taxes, royalties etc.

1.1.2 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 inter-relations between various parts of works/trades. No claim shall be entertained on the basis of compartmental interpretations.

1.1.3 The classification of various items of works for purposes of measurements and payments shall be as per bills of quantities (BOQ) and apply to all heights, depths, sizes, shapes and locations. They also cater for all cuts and wastes

1.1.4 **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, the cost being held to be included in the Contract Rates

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, Over head charges as well as general liabilities, obligations, insurance and risks arising out of GCC, required to complete and maintain the works to the satisfaction of the Engineer.

3 Adequate lighting for night work, and also whenever and wherever required by the Engineer.

4 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 signages as directed.

All fences, barricade shall be painted with colour shades as specified by the Engineer.

5 All equipment, instruments, labour and materials required by the Engineer for checking alignment, levels, slopes and evenness of surfaces measurements and quality etc.

6 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.

7 Cost of Preparation and compliance with provision of a quality assurance control program.

8 Cost of safe guarding the environment.

9 A testing laboratory as specified by the Engineer equipped with the following minimum apparatus, materials and competent trained staff required for carrying out tests, as specified in the relevant sections of the specifications:-

i. 1 Set of standard sieves for testing grading of sand with mechanical sieve shaker.
ii. Sieves with openings respectively of 4.75mm, 10mm, 20mm, 25mm, 30mm for testing grading of aggregates.
iii. Weighing Balance of capacity up to 10 Kg. reading up to 5 gm.
iv. Electric Thermostat controlled oven and pans for drying of sand and aggregates.
v. Glass measuring flasks of 1/2, 1 liter & 2 liter capacity.
vi. Flask for determining moisture content of sand.
vii. Slump cone with rod and V B Apparatus, flow table to measure slump.
viii. Apparatus to measure permeability of concrete as per Appendix 1700/II of MOST Specifications.
ix. Minimum 24 Nos. steel moulds for 150mm x 150mm x 150mm concrete test cubes. It may be necessary to provide more steel cube moulds depending upon concreting programme.
x. 25mm diam. vibrator for compaction of concrete in test cubes and also vibrating table.
xi. Concrete cube testing machine of 200 tons capacity with 3 dial gauges electrically operated.
xii. Work benches, shelves, desks, sinks and any other furniture and lighting as required by the Engineer.
xiii. Abrasion & Impact testing Equipment for Testing coarse aggregate.
xiv. Silt Testing Equipment.
xv. Any other equipment specified by Engineer.

1.1.5 **Quality Assurance & Quality Control**:

1 The work shall conform to high standards of 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 and Quality Control 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 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 and the cost of these tests shall be born by the contractor. 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 test 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 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 authorised representative if permitted by the Test House. Whether witnessed by the Contractor or not, the test results shall be binding on the Contractor.

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.

1.1.6 **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.

1.1.7 **Materials:**

1 **Source of Materials***:*

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 test certificates. Samples of all materials proposed to be

employed in the permanent works shall be submitted to the Engineer 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 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 specification, 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, at site or at any testing laboratory or institution as directed by the Engineer. No extra payment shall be made on this account.

4 **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.

5 **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.

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

1.1.8 **Storing of Materials at site**:

The storage of materials shall be in accordance with IS 4082 "Recommendation on stacking and storage or 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.

1.1.9 **Water:**

1 **Water from approved source**:

Potable water only shall be used for the works. 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 all such Tests shall be borne by the contractor.

1.1.10 **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 shall be rejected and the same shall be rectified, or removed and replaced with work of the required standard of workmanship at no extra cost.

3 During the period of construction or within the defect liability period the Engineer may at his discretion reject the concrete 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.

1.2 **Structural Work**:

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

1.2.2 Minimum cement content specified in CPWD specification 1996 is purely from durability point of view. Larger content of cement shall have to provided if demanded by mix design.

1.2.3 Procedure of mixing the admixtures shall be strictly as per the manufacturer's recommendations if not otherwise directed by the Engineer.

1.2.4 Special benches shall be provided at site for stacking reinforcement bars of different sizes.

1.2.5 In the mobilisation period, the contractor shall carry out expeditiously and without delay the following works:

a. Material testing and mix designs of concrete as contemplated in the specifications.

b. Setting up of full-fledged site laboratory as per the requirements of these specifications.

c. Any other pre-requisite items required for final execution.

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SECTION – 2
CONCRETE: PLAIN & REINFORCED

These specifications shall be read in conjunction with the CPWD specifications 1996, MOST Specifications and other relevant specifications described in the Section 1.1 of these Specifications.

2.1 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 on to the 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 a 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 contractors to purchase and use materials from any particular source, as may in his opinion be necessary for the proper execution of work.

2.1.1 **Cement**

2.1.1.1 The cement used shall be one of the following types:

a) 43 grade Ordinary Portland Cement conforming to IS: 8112.

b) 53 grade Ordinary Portland Cement conforming to IS: 12269.

2.1.1.2 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.

2.1.1.3 Packaged cement shall be delivered to the site in original sealed bags, which shall be labeled with the weight, name of manufacturer, brand and type. Cement received in torn bags shall not be used.

2.1.1.4 All cement shall be fresh when delivered and at ambient atmospheric temperature.

2.1.1.5 With each and every delivery of cement the contractor shall provide manufacturers 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 on cement as per IS: 4031, IS: 650, IS: 10080.

2.1.1.6 Total chloride content in cement shall in no case exceed 0.05 percent by mass of cement. Also, total sulphur content calculated as sulphuric anhydride (SO_3), shall in no case exceed 2.5 percent and 3.0 percent when tri-calcium aluminate per cent by mass is upto 5 or greater than 5 respectively.

2.1.2 **Aggregate**

Aggregates from natural sources shall be in accordance with IS: 383. 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.

2.1.2.1 **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, stone dust or other approved sand. It shall be free from clay, loam, earth or vegetable matter and from salt or other harmful chemical impurities. It shall be clean, sharp, strong, angular and composed of hard siliceous material.

The grading of fine aggregate when determined as described in IS:2386 (part I), shall be within the grading zones I, II, III.

The contractor shall provide complete facilities at site for carrying out the following tests:

A) Proportion of clay, silt and fine dust by sedimentation method as per IS: 2386 part II

B) Moisture content in fine aggregate as per IS: 2386 Part III.

C) Bulk density/Bulkage.

2.1.2.2 **Coarse Aggregate**

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.

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.

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. Unless otherwise permitted by the Engineer the nominal maximum size shall not exceed 20 mm.

2.1.2.3 **Water**

2.1.2.3.1 Water used in the works shall be potable water and free from deleterious materials. Water used for mixing and curing concrete and washing aggregate

shall be fresh and clean free from injurious amounts of oil, salts, acids, alkali, other chemicals and organic matter.

Water shall be from the source approved by the Engineer and shall be in accordance with IS: 456.

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.

2.2 Blending of aggregates:

In order to obtain optimum workability, individual aggregates of nominal size 20mm, 10mm, 4.75mm and 2.36mm will be blended in such a way that the grading curve for all in aggregates will be a smooth curve from size 0.15mm to 25mm falling within the established envelop grading curve. Contractor shall establish envelope-grading curve for each grade of concrete for given maximum size of aggregates and get it approved by Engineer before finalising the mix design.

2.3 Admixtures:

1 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 the Admixtures.

2 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.
   d. Whether or not the admixture leads to the entrainment of air when used in the manufacturer's recommended dosage.
   e. Where two or more admixtures are proposed to be used in any one mix, the manufacturer's written confirmation of their compatibility.

3 In reinforced concrete, the chloride content of any admixture used shall not exceed 2 percent by weight of the admixture as determined in accordance

with IS:6925 and the total chloride and sulphate contents in concrete mix shall not exceed 0.15 and 4.0 percent respectively by weight of cement.

4 The admixtures when used shall conform to IS:9103. The suitability of all admixtures shall be verified by trial mixes.

5 The addition of calcium chloride to concrete containing embedded metal will not be permitted under any circumstances.

6 Retarding admixtures when used shall be based on lingosus-Phonates with due consideration to clause 5.2 and 5.3 of IS: 7861.

2.4 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 recognized manufacturers.

2.5 Grade of Concrete:

The concrete is designated as follows:

Concrete M 35 / 20

The letter M refers to the mix

The number 35 represents the characteristic compressive strength of 15cm cubes at 28 days in MPa (Mega Pascals : 1 MPa : 10 kg/cm^2 approximately). M35 concrete thus has a characteristic strength of 350 kg/cm^2. Other mix design will also denoted in same way.

The number 20 represents the nominal size of the aggregate in mm.

2.6 Mix Design :

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. 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.

2.7 Additional tests for Concrete:

As frequently as the Engineer may require, additional testing shall be carried out for concreting in addition to mandatory test specified in CPWD specifications 1996/ relevant IS Code / MOST Specifications.

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 1716.5 of MOST Specification and DIN 1048.

1 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.

2 From the batches thus selected two concrete cylinders shall be made in accordance DIN 1048.

3 All cylinders shall be made, cured, stored, transported and tested in accordance with clause 1716.5 of MOST Specifications. The tests shall be carried out in a laboratory approved by the Engineer.

4 At least two cylinders shall be made on each day's concreting until 60 cylinders have been made for each grade of concrete. This is in the initial period.

5 After the initial period, subject to the acceptance of the Engineer, the frequency at which the cylinders shall be made may be reduced as follows:

(1 set = two cylinders, representing concrete from a different batch.)

At least 1 set for each day's concreting consisting of:

i. 1 set for every 10 m^3 or part thereof concrete for critical structural elements plus 1 set for every 40 m^3 or part thereof for all other elements.

ii. If concrete is batched at more than one point simultaneously the above frequency of making cylinders shall be followed at each point of batching.

The cylinders will be tested as per the procedure, given in Clause 6 next.

6 Test Procedure:

The permeability of concrete will be verified by the following procedure:

i. Prepare a cylindrical test specimen 150 mm dia and 160mm high.

ii. After 28 days of curing, test specimen will 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/II of MOST.

iii. At first a pressure of one bar is applied for 48 hours, followed by 3 bars for 24 hours and 7 bars for next 24 hours.

iv. After the passage of the above period, the specimen is taken out and 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).

7 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 25mm.

No extra payment shall be made for this test and cost of the same will be included in his rate for concrete work.

2.8 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.

2.9 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 temperature exceeding 40 degree C, 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

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.

2.10 Transporting, Placing, Compacting and Curing :

Transporting, placing, compacting and curing of concrete shall be in accordance with IS: 456.

1 Transporting:

The mix after discharging from the mixer shall be transported by wheel barrows, buckets, pumps etc. 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.

2 Placing:

The method of placing shall be such as to prevent segregation. 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.

3 Compaction:

Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete.

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 covering 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.

4 Curing:

i. Curing of concrete shall be complete and continuous using water that is free of harmful amounts of deleterious materials that may attach, stain or discolor the concrete.

ii. Immediately after compaction and completion of any surface finishes the concrete shall be protected from the evaporation of moisture by means of polythene sheathing, wet hessian or other material kept soaked by spraying. As soon as the concrete has attained a degree of hardening sufficient to withstand surface damage moist curing shall be implemented and maintained for a period of at lease 15 days after casting.

iii. 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.

2.11 Cracks:

If cracks, which in the opinion of the Engineer may be detrimental to the strength of the construction, the contractor shall dismentle the construction, carryaway the debris, replace the construction and carry out all consequential work thereto. The Contractor at his own expense shall grout the cracks with neat cement grout or with other composition as directed by Engineer 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.

2.12 Defective Concrete:

Should any concrete be found honeycombed or in any way defective, such concrete shall on the instruction of the Engineer be cut out partially or wholly by the Contractor and made good at his own expense.

2.13 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.

2.14 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 of a key.

2.15 Ready Mix Concrete and Pumping:

1 Ready-mixed concrete may be manufactured in a central automatic weigh Batching plant and transported to the place of work in agitating transit mixers.

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.

2. **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 pumpable 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.

3. **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.

4. **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 number 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.

5 **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.

6 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.

7 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.

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SECTION – 3
FORM WORK

3.1 These specifications shall be read in conjunction with the CPWD specifications 1996, MOST Specifications and other relevant specifications described in the section 1.1 of these specifications.

3.2 Materials:

Formwork shall be of steel or any other suitable material as approved by the Engineer. The formwork shall be capable of resisting damage to the contact faces under normal conditions of erecting forms, fixing steel and placing concrete. The selection of materials suitable for formwork shall be made by the Contractor based on the quality consistent with the specified finishes and safety.
All 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.

Steel formwork shall be made of minimum 4 mm thick black sheets stiffened with angle iron frame made out of M.S. angles 40 mm x 6 mm supported at suitable spacing.

3.3 Design & Drawings:

The formwork, falsework, jigs, fixtures and supports etc. shall be designed by the Contractor and approved by the Engineer before starting of work. It shall be constructed so that the concrete can be properly placed and thoroughly compacted to obtain the required shape, position and level subject to specified tolerances Approval of the proposed formwork by the Engineer will not diminish the Contractor's responsibility for the satisfactory performance of the formwork, nor for the safety and co-ordination of all operations.

Methodology for removal of form should be planned as a part of total form work design.

3.4 Erection of Formwork:

The following shall apply to all formwork:

1 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 I.S. Code).

2 Provision shall be made for adjustment of supporting struts where necessary. When reinforcement 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.

3 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.

4 Surfaces of forms in contact with concrete shall be oiled with a mould oil of approved quality or clean diesel oil. 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 of the surface of the concrete 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 it is left in place. Nothing extra shall be paid to contractor for oiling.

5 Immediately before concreting is commenced, the formwork shall be carefully examined to ensure the following :

- a Removal of all dirt, shavings, sawdust and other refuse by brushing and washing.
- 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 That all wedges are secured and firm in position.
- e That provision is made for traffic on formwork not to bear directly on reinforcing steel.

3.5 Concrete Finishes :

This section deals with the surface of concrete on which forms had been fixed while concreting.

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 finish for plinth 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.

The top of plinth shall be 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 surfacefree from blemishes and trowel marks and having slightly glossy appearance. Surface irregularities shall not exceed 5mm.

3.6 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 shall be removed by the Contractor as directed by the Engineer and fresh concrete placed without extra cost, as instructed by the Engineer. All materials, sizes and layouts of formwork including the locations for their joints shall have prior approval of the Engineer.

3.7 Age of Concrete at Removal of Formwork :

In accordance with CPWD Specifications 96 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.

3.8 Reuse of Forms:

The Contractor shall not be permitted reuse of timber facing 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 items 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.

SECTION 4
REINFORCEMENT

4.1 These specifications shall be read in conjunction with the CPWD specifications 1996, MOST Specifications and other relevant specifications described in the section 1.1 of these specifications.

Any 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.

4.2 Inspection & Testing:

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.

No work shall be commenced without the Engineer's approval of the bar bending schedule.

Specimens sufficient for Tensile Tests for each different size of bar for each consignment delivered, or as per relevant IS code, whichever is less shall be sampled and tested by the Contractor. Batches shall be rejected if the average results of each batch are not in accordance with the specifications.

4.3 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. 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. 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.

4.4 Spacing, Supporting and Cleaning:

1 All reinforcement shall be placed and maintained in the positions shown on the drawings.

2 All cover blocks shall be of concrete (not sand cement mortar) and of the same strength as that of the surrounding concrete and properly compacted. They shall be circular in shape for side cover and square for bottom cover. The cost of cover block shall be deemed to have been included in the rates.

3 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.

4 The HYSD bars shall be provided using cement and inhibitor using following procedure:

- i Cleaning of steel by wire brush for dust and rust.
- ii Apply one coat of Cement slurry [1 kg cement & 600 cc of inhibitor solution (Patent No. 109784/67)] by dipping or brushing. Allow it to dry for 24 hours in shade. The water is not to be used. The inhibitor solution is prepared in ionised water.
- iii No extra payment shall be made for the same.

5 G.I. wire shall be used for binding reinforcement.

4.5 Welding:

1 Wherever specified all lap and butt-welding of bars shall be carried in accordance with IS: 2571. Only qualified welders shall be permitted to carry out such welding.

2 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.

3 Bars shall be free from rust at the joints to be welded.

4 Slag produced in welding after alternative run should be chipped and removed by brush.

5 Electrode should not be lighted by touching the hot bar.

6 The welding procedure shall be approved by the Engineer and tests shall be made to prove the soundness of the welded connection.

Section 6 – Employer's Requirement (ERQ)

(Particular Specifications)

Annexure – 2

TECHNICAL SPECIFICATION FOR FASTENING SYSTEM 336

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Technical Specifications of Fastening System 336

A. The fastening system 336 for ballastless track should comply with performance criteria issued by Ministry of Railways vide their letter No.2009/Proj/MAS/9/2 dated 21.05.2010 or approved by Ministry of Railways. The proposed fastening system should have satisfactory performance on established Metro System – Mainline. The tenderer shall submit the technical details and test reports to substantiate the compliance of performance dated 21.05.2010 or submit details of approval of Ministry of Railways along with the compliance of all observations of MOR, if any, while granting such approvals.

B. The Technical Proposal to be submitted by tenderer, shall clearly demonstrate the understanding and comprehension of the supply, including Preliminary Scheme/drawings Fastenings System 336. Fastening System 336 shall be used in the Depot Tracks also and further keeping in mind the required approvals from, and sanctions granted by, the Ministry of Railways /RDSO, Govt. of India.

C. Manufacturing Units for Supply of Fastening System 336:

a. The bidder shall enclose a list of companies for the Manufacturing of all components of fastening system 336 from whom the successful supply of fastening system 336 have been made in the past along with the Manufacturing Record of the Units in **Annexure C of TS**. Each list shall consist of a preferably two companies per item, whose product specifications and manufacturing processes fully conform to the relevant Codes and Railway Standards, and the requirements of these Contract Documents.

b. The bidder to note that supply of critical components of fastening system 336 (Tension Clamp, Helical Spring & Elastomeric Pad) shall be made only from those manufacturing plants (to be submitted by bidder in **Annexure C of TS**) from where successful supply have been made in the past to user railway administration. In this regard bidder has to submit undertaking of readiness from owner of manufacturing units for supply to JMRC Project under this tender. Undertaking from manufacturing units of other component shall be also required if bidder wishes to take supply from manufacturing units given in **Annexure C of TS**.

c. However if other components (other than Tension Clamp, Helical Spring & Elastomeric Pad) are proposed to be supplied from different units as mention in para a & b above then supply of these components can be made from proposed manufacturing units manufacturing similar components to other track fastening system of ballastless track under strict supervision and quality assurance of bidder subject to following:

(i) Bidder to submit manufacturing Record of the Units in **Annexure D of TS** for the past supply of similar components for different ballastless track fittings.

(ii) Bidder to submit adequate documentary evidence to prove the authenticity shall be enclosed with these lists, which may include test results, reports, certificates, brochures, etc for similar components.

(iii) Bidder has to submit undertaking of readiness from owner of manufacturing units for supply to JMRC Project under this tender.

(iv) If no proposal is submitted for alternate manufacturing units in **Annexure D of TS**, it will be assumed that supply shall be made from units given in **Annexure C of TS** by bidder with submission.

(v) This will be allowed only after critical examination of manufacturing unit by purchaser or its authorised representative after award of tender. In case purchaser disapproves supplier's proposal due in adequacy of capabilities of manufacturing units proposed during tender, supplier shall be bound to supply the components from manufacturing units given in **Annexure C of TS** required under Clause C (a) above.

D. The Bidder shall submit as part of his Technical Proposal a completed and signed certificate as attached to **Annexure B**, identifying any minor deviations without any costs allocated to the deviations. If no minor deviations are to be reported, **Annexure B** must still be completed and signed by the Bidder confirming that no minor deviations exist.

E. Any Tenders containing any material deviations or reservations or conditions as described in Instructions to Bidders may be deemed by the Employer to be non-responsive.

F. **Fastening System 336 for Ballastless track** - With respect to the fastening system 336 for ballastless track to be supplied by the Bidder, the following minimum information/ certification should be provided by the bidder.

a. Technical Details and Compliance of Fastening System 336 for Ballastless Track

(i) The bidder to demonstrate that fastening system 336 to be supplied by him is a proven system.

(ii) The bidder to submit the technical details and test reports to substantiate the compliance in juxtaposition to each clause and sub-clause of the performance criteria along with all documents of performance dated 21.05.2010. (**Annexure – A of TS**)

(iii) The bidder shall submit three sets of

a. Test Report from independent laboratory / Institution showing the compliance of Performance criteria.
b. The test reports should be accompanied with the drawing of the fastening system and its components with dimension to clearly establish that the fastening system 336 including its components which have been tested and reported upon is same as the fastening system 336 including its components that has been proposed by the Tenderer in this Tender.
c. Technical details.

(iv) The bidder should submit the standard specifications, allowable tolerances, dimensions of assembly and components of fastening system.

(v) The complete fastening assembly shall be insulated from plinth/RCC slab.

(vi) The packaging, handling & stacking/storage of all components shall have prior approval of the Purchaser but this shall not absolve the Supplier from his responsibility for supplying the material at site in undamaged condition. All imported components shall be packed and shipped without causing damage to it. The material classified as damaged by the purchaser shall be on supplier's account.

(vii) The material and equipment having specific provisions of packing and stacking/storage shall be packed and stacked/stored in accordance with their technical specifications in addition to that described above.

b. Fastening system 336 already approved by Railway Board shall be preferred. In addition to documents mentioned above for already approved fastening system 336, bidder has to submit certificate along with all annexure and compliance of all observation of MOR along with proof.

c. If new fastening system 336 other than already approved by Railway Board, is proposed, bidder is required to submit all documents as per performance criteria (**Annexure A of TS**) and other documents required under this tender, if these details are not submitted along with supporting documents, tender shall be summarily rejected.

G. Single Point Responsibility - All components of fastening system 336 shall have single point complete system quality responsibility from bidder.

H. MoU with Patent Holder - The Bidder should submit an undertaking to the effect that if the bidder becomes the successful bidder and the system of track and/or fastening offered by the bidder is a Patented one then the Bidder shall before the award of the contract furnish copy of the MoU entered into between the bidder and the Patent holder permitting the bidder to use the Patented items for the tendered work.

I. Design Life of Individual Component of Fastening System 336 - Bidder to submit undertaking for the design life of individual component as given in the performance criteria.

J. The above documents should be submitted in English language. In case any document is in any other language then it should be accompanied by an English translation and must be notarized for truthfulness.

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ANNEXURE – 'A'

DETAILS OF TECHNICAL SPECIFICATION OF FASTENING SYSTEM 336 AND INSPECTION AND TEST PLAN

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Technical Specifications of Fastening System 336 already used by Jaipur Metro

1. Details of fastening system 336 with 2 anchor bolts and with 4 anchor bolts and components there of as per following details:

1.1 Fastening system 336 for ballastless Tracks with 2 Anchor Bolts, each assembly per rail seat consisting of:

SN	Pieces	Item
1	2	Washer
2	2	T-head Bolt with nut
3	1	Rail Pad
4	2	Collared Washers
5	2	Insulating Bush
6	1	Ribbed Base plate
7	1	Pad
8	2	Anchor Bolt M27x285 with forged collar type having 11mm projection & Hexagon Nut
9	2	Tension Clamp Skl 12
10	2	Helical Spring
11	1	Elastomeric Pad

1.2 Fastening System 336 for ballastless Tracks with 4 Anchor Bolts, each assembly per rail seat consisting of:

SN	Pieces	Item
1	2	Washer
2	2	T-head Bolt with nut
3	1	Rail Pad
4	4	Collared Washers
5	4	Insulating Bush
6	1	Ribbed Base plate
7	1	Pad
8	4	Anchor Bolt with forged collar type having 11mm projection & Hexagon Nut
9	2	Tension Clamp Skl 12
10	4	Helical Spring
11	1	Elastomeric Pad

2. Technical Details of Fastenings System 336

Brief technical specifications, dimensions along standards applicable for manufacturing and testing for each component of fastening system 336 have been given in the following para. Supplier has to note that any change in technical specification or standards of manufacturing process of testing shall be only allowed after approval of purchaser if it will enhance quality and performance of fastening system 336 in service life. For approval of same, supplier will be required to submit copy of all technical specification given in the following para along with copies of revised standards with justification. Fastening system 336 already approved by railway board with minor change in technical specification w.r.t. specification given in following paras, shall be allowed only after critical examination by purchaser. Normally change in dimension of components shall not be allowed except minor change if already approved by railway board or proven elsewhere and can be accommodated in plinth design, can be considered.

(i) Tension clamp

a	The material shall be an alloy spring steel according to DIN 17221.
b	Tension clamps shall be provided with an anti-corrosive protection e.g. KTL-coating of approx. 15 μm,

(ii) T-head bolt Hs 32 with hexagon nut and single washer

a	The T- head bolt shall be made of the material in accordance with the latest edition of UIC 864-2 and DIN EN ISO898 T 1
b	The nut is made of the material in accordance with the latest edition of UIC 864-2V and DIN EN 20898 T 2
c	The washer shall be made in accordance with the latest edition of DIN 522 C
d	**Strength Classification** T-head bolt: 4.6 according to DIN EN ISO898 T1 and UIC 864-2.

Tensile strength	min 400 N/mm^2
Elongation at break	min 22%
Yield point	min 240 N/mm^2
Hexagon- nut	5.0 according to DIN EN 20898 T2 and UIC 864-2
Tensile strength	min 500 N/mm^2
Hardness	146-302 Hardness Vickers
Washer	Cold rolled material according to DIN EN10025
Tensile strength	590-740 N/mm^2
Hardness	170-220 Hardness Vickers

e	The T- head bolts, nuts and washer shall be provided with an anti-corrosive protection. The protection shall be of hot dipped galvanized coating of thickness >= 55 μm for T-head bolts & washer, and zinc plated yellow chromate coating of thickness >= 8 μm for Nuts

(iii) Rail Pads

a	Rail pads shall be made of EVA (Ethyl Vinyl Acetate) for tropic conditions or similar material, stabilised against UV-light by 1%- 1,7% carbon, in compliance with UIC Leaflet 864-5
b	Properties

Shore-D- Hardness	32-47 Shore-D in accordance with DIN 53505
Melt Flow Index	(MFR 190/2,16) ≤ 5.2 g/10 min in accordance with DIN ISO 1133
Carbon Black Contents	1-1,7% in accordance with DIN 53585
Density	0.950 g/cm3 in accordance with DIN 53479
Volume Resistivity	>10^8 Ohm * cm in accordance with DIN IEC93 / DIN IEC 167
Static Stiffness	Measured as a secant stiffness between 18 and 68 KN shall be more than 450 kN/mm.
Tensile Strength	Minimum 17 N/mm^2 in accordance with DIN EN ISO 527-2,
Yield Strength	Minimum 6.5 N/mm2 in accordance with DIN EN ISO 527-2.
Elongation	Minimum 700% in accordance with DIN EN 527-2.

(iv) Anchor Bolts with self locking nut

a The anchor bolt shall be made of the material in accordance with the latest edition of DIN EN ISO898 T1, DIN 13 and DIN 76.

b Properties

Strength Classification	8.8 according to DIN EN ISO898 T 1.
Tensile strength	Min 830 N/mm2
Elongation at break	Min 12%
Yield point	Min 660 N/mm2
Self locking nut	according to DIN EN ISO 7042 / 10513

c The bolt shall be supplied with an anti-corrosive protection of hot dipped galvanized coating of thickness >= 55 μm, and Nut with a coating of zinc plated yellow chromated with coating thickness >= 8 μm

(v) Insulating Bush

a The material shall be made of glass reinforced synthetic material with about 30% of glass fibre reinforcement, and resistance to ultraviolet radiation or equivalent material with the same physical properties as approved by the Purchaser.

b Properties

The raw material shall have the following properties:

a	Density	1.35-1.45 g/cm^3
b	Moisture content	1%-2,5%

(vi) Collard Washer

a The material shall be made of glass reinforced synthetic material with about 30% of glass fibre reinforcement, or similar material and resistance to ultraviolet radiation or equivalent with the same physical properties and as approved by the Purchaser.

b Properties

The raw material shall have the following properties:

a	Density	1.35-1.45 g/cm^3
b	Moisture content	1%-2,5%

(vii) Base Plate (Cast Iron)

a The base plate shall be made of the material in accordance with the latest edition of DIN EN 1563.

b Properties

Strength Classification

Steel category EN GJS 600 – 3U (GGG 60) according to DIN EN 1563 (Spheroidal graphite cast iron)

Tensile Strength	min 600 N/mm^2
Elongation at Break	min 3 %
Yield Strength	min 370 N/mm^2

(viii) Elastomeric base plate pad

a The Elastomeric base plate pad shall be manufactured from volume compressible material (e.g. foamed polyurethane –PU) etc. and as approved by the Purchaser.

b Properties

Static Elasticity	Standard C_{stat} = approx 22,5 KN/mm at room temperature (measured as a secant rigidity between 18 and 68 kN)
Dynamic Elasticity	All elastomers react stiffer under dynamic loads than under static loads. The stiffening factor depends on the load and the frequency. This factor shall not be more than 1.4 and as approved by the Purchaser.
Volume Resistivity	$>10^8$ Ohm * cm in accordance with DIN IEC 93 / DIN IEC 167 T-30.

The material shall provide excellent resistance against ozone, even in higher concentrations as in usual test methods. The pads shall be long lasting, weather resistant, water resistant as well as oil and grease resistant.

(ix) Helical Spring

a The material shall be wire in accordance with latest edition of DIN 2076 and DIN 17223

b Properties

Stiffness	212 N/mm
Turn of coil	4, 5

The spring shall be provided with an anti-corrosive protection KTL-coating of app. 15 μm.

(x) Intermediate Pad

a The shims are manufactured from EVA or similar material and shall be stabilised against light / UV damage.

Rail Pad					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Material test certificate of the manufacturer	Eye	Document review	1 per instalment of supply	EVA with 7 +2/-4 % VA Melt Flow Rate ≤ 5,2 g/ 10 min
Rail Pad	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge)	Measuring	1 sample per 500 Pads or part thereof	
	Length				165 ±2
	Width				148 ±1,5
	Thickness				6 ±0,22
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Tensile strength	Tensile testing machine	Measuring	1 sample per instalment of supply	≥ 17 N/mm²
	Yield strength				≥ 6,5 N/mm²
	Elongation				≥ 700% according to DIN EN ISO 527-2
	Volume resistivity	Measuring instrument	Measuring	1 sample per instalment of supply	≥ 10^8 Ω cm according to DIN IEC 60093
	Carbon black contents	Measuring instrument	Measuring	1 sample per instalment of supply	1,0 - 1,7 % according to DIN 53585
	Hardness	Hardness tester / Shore D	Measuring	3 sample per 5,000 Pads or part thereof	32 - 47 Sh D according to DIN 53505
	Melt flow rate	Melt flow rate tester	Measuring	1 sample per 15,000 Pads or part thereof	≤ 5,2 g/ 10 min according to DIN ISO 1133
	Density	Balance	Measuring	1 sample per 15,000 Pads or part thereof	≤ 0,950 g/ cm³ according to DIN 53479
	Static Stiffness	Universal testing machine	Measuring	1 samples for the total quantity under contract	≥ 450 kN/mm

Washer for T-Head Bolt					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the wire rod manufacturer	Document review	1 per heat	according to DIN EN 10025 or DIN EN 10139
	Tensile strength	Universal Testing Machine	Measuring	1 per heat	min. 590 N/mm²
Washer	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge)	Measuring	1 sample per 1,000 Washers or part thereof	
	Outside diameter				49,40 - 50,00
	Inside diameter				23,00 - 23,52
	Thickness				3,40 - 4,60
	Plane				max. 0,6
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Hardness	Hardness tester / Vickers	Measuring	1 sample per 1,000 Washers or part thereof	170 - 220 HV 10
	Coating (hot dip galvanised)	Measuring instruments	Measuring	3 samples per 20,000 Washers or part thereof	Coating thickness ≥ 55 µm

T-Head Bolt					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the manufacturer	Document review	1 per heat	according to DIN EN ISO 898
	Tensile strength	Universal testing machine	Measuring	2 samples per Heat	Rm ≥ 400 N/mm²
	Yield strength				Re ≥ 240 N/mm²
	Elongation at break				A ≥ 22 %
	Bend test	Universal testing machine	Measuring	2 sample per Heat	By a bending angle of 90° the material should not have any cracks
Screw	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Nos. or part thereof	
	Head length + square				(17 ±0,5) + (6 ±0,2)
	Head width				53,5 ±1,5
	Head height				27 ±0,5
	Shank diameter				22 +1/-0,5
	Width across flats				26 ±0,5
	Screw length				40 +3/-1
	Total length				(55 ±1,25) + (17 ±0,5)
	Outside diameter	Gauge	Gauge measuring		M 22/ 21,428 - 22,000
	Pitch diameter				M 22/ 20,013 - 20,376
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/
	Visual judgement screw M22 g				Form
	Screw test	Manual	Function test		Regular screwed joint
	Analysis	Spectral analysis	Measuring	1 sample per Heat	According to DIN EN ISO 898
	Coating (hot dip galvanised)	Measuring instruments	Measuring	3 samples per 20,000 Nos. or part thereof	Coating thickness ≥ 55 µm

Tension Clamp Skl 12					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Tension Clamp	Analysis	Material test certificate of the wire rod manufacturer	Document review	1 sample per Shipment	C 0.35 – 0.42 % Si 1.50 – 1.80 % Mn 0.50 – 0.80 % S max. 0.030 % P max. 0.030 % according to DIN 17221
	Analysis	Spectral analysis	Measuring	1 sample per Shipment	
	Dimensional check				
	Complete dimension	Measuring instruments	Measuring	1 sample per Shipment	According to drawing
	Functional dimension Service height	Measuring instrument	Measuring	1 sample per 2400 Clamps or part thereof	18,5 ±1,5 mm
	Hardness according to DIN EN ISO 6507	Hardness tester / Vickers	Measuring	1 sample per 2400 Clamps or part thereof	400 - 460 HV 30
	Spring test	Spring testing machine	Measuring	1 sample per 2400 Clamps or part thereof	≥ 7,5 kN / Loaded in a special device with 25 kN. After relief by 4 mm the test load must be ≥ of 7,5 kN.
	Visual judgement surface	Eye	Visual check	1 sample per 2400 Clamps or part thereof	Surface free of function-impairing cracks and damage/ form
	Creep resistance	Universal testing machine	Measuring	2 samples (in one assembly/ rail seat) per Shipment	≥ 9,0 kN
	Fatigue strength	Fatigue strength testing machine	Measuring	2 samples (in one assembly/ rail seat) for the total quantity under contract	≥ 5 million load cycles at an amplitude of 1,4 mm
	Decarburization	Microscope	Measuring	1 sample per Shipment	≤ 0,20 mm
	Surface defects	Microscope	Measuring	1 sample per Shipment	≤ 0,20 mm
	Microstructure	Microscope	Visual judgement	1 sample per Shipment	Martensite
	Non-metallic inclusions	Microscope	Visual judgement	1 sample per Shipment	≤ 2.5 (Reference test method)
	Coating (KTL)	Measuring instrument	Measuring	3 samples per 20,000 Clamps or part thereof	Coating thickness ≥ 15 µm

Ribbed Plate (cast iron) for Skl 12					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Ribbed Plate	Analysis	Spectral analysis	Spectral analysis	1 per heat	according to DIN EN 1563
	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Plates or part there of	
	Total length				392 ±3
	Total width				160 ±3
	Length	Pitch centre distance	Gauge check		320 ±0,5
	Width	Gauge			90 ±0,5
	Diameter	Measuring instruments (e.g. calliper gauge, projector)	Measuring		44 +1
	Distance				84 ±0,5
	Distance of ribs				152 +1
	Rib height				33 +1/-0,5
	Rib height				25 +1/-0,5
	Rib width				33 ±0,5
	Thickness				15 ±0,5
	Thickness				17 ±0,5
	Inclination				1 : 20
	Plane				max. 1
	Width				56,5 +3/-0,5
	Width				28 ±1
	Width				50 ±1
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Tensile Test	Tensile machine	Measuring	3 samples per 10,000 Plates or part thereof (test bar cast separately during production)	Tensile strength $Rm \geq 600$ N/mm² Yield strength $Re \geq 370$ N/mm² Elongation $A_5 \geq 3$ % according to DIN EN 1563
	Hardness	Hardness tester/ Brinell (10mm ball/ 3000kg load)		3 samples per 10,000 Plates or part thereof	175 – 290 HB

Nuts for T- Head Bolt					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the wire rod manufacturer	Document review	1 per heat	according to DIN EN 20898 T2
	Tensile strength	Universal Testing Machine	Measuring	1 per heat	min. 500 N/mm² according to DIN EN 20898 T2
Nut	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Nuts or part thereof	
	Wrench size				39 -1
	Height				22 ±1
	Thread dimensions	Plug gauge	Gauge measuring		M 22-2,5 6h
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/
	Widening test (Drifting)				to be carried out in care of presents of any doubtful discontinuities on the surface
	Screw test	Hand	Function test		regular screwed joint
	Hardness	Hardness tester / Vickers	Measuring	1 sample per 500 Nuts or part thereof	146 - 302 HV according to DIN EN 20898 T2
	Proof load test	Universal testing machine		3 samples per 20,000 Nuts or part thereof	190,9 kN
	Coating (zinc platted yellow chromated)	Measuring instruments	Measuring	3 samples per 20,000 Nuts or part thereof	Coating thickness ≥ 8 µm

Nuts for Anchor Bolt					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the manufacturer	Document review	1 per heat	according to ISO 2320 class 8
	Tensile strength	Universal Testing Machine	Measuring	1 per heat	min. 830 N/mm²
Nut	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Nuts or part thereof	
	Wrench size				41 -1
	Height				26 ±1
	Thread dimensions	Plug gauge	Gauge measuring		M 27-3 6h (at least one thread)
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Widening test (Drifting)				to be carried out in care of presents of any doubtful discontinuities on the surface
	Hardness	Hardness tester / Vickers	Measuring	1 sample per 500 Nuts or part thereof	255 - 335 HV
	Proof load test	Universal testing machine	Measuring	3 samples per installment	408,5 kN
	Screw Torque test	Torque moment tester	Function test	3 samples per installment	First unscrewing ≥ 13,5 Nm
	Coating (zinc platted yellow chromated)	Measuring instruments	Measuring	1 sample per 500 Nuts or part thereof	Coating thickness ≥ 8 µm

Intermediate Pad					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Material test certificate of the manufacturer	Eye	Document review	1 per instalment of supply	EVA with 7 +2/-4 % VA Melt Flow Rate ≤ 5,2 g/ 10 min
Pad	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge)	Measuring	1 sample per 500 Pads or part thereof	
	Length				392 ±3
	Width				160 ±3
	Distance of holes				320 ±0,5
	Distance of holes				90 ±0,5
	Diameter				32 +1
	Thickness				5 ±0,5
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Tensile strength	Tensile testing machine	Measuring	1 sample per instalment of supply	≥ 17 N/mm²
	Yield strength				≥ 6,5 N/mm²
	Elongation				≥ 700% according to DIN EN ISO 527-2
	Volume resistivity	Measuring instrument	Measuring	1 sample per instalment of supply	≥ 10^8 Ω cm according to DIN IEC 60093
	Carbon black contents	Measuring instrument	Measuring	1 sample per instalment of supply	1,0 - 1,7 % according to DIN 53585
	Hardness	Hardness tester / Shore D	Measuring	3 sample per 5,000 Pads or part thereof	32 - 47 Sh D according to DIN 53505
	Melt flow rate	Melt flow rate tester	Measuring	1 sample per 15,000 Pads or part thereof	≤ 5,2 g/ 10 min according to DIN ISO 1133
	Density	Balance	Measuring	1 sample per 15,000 Pads or part thereof	≤ 0,950 g/ cm³ according to DIN 53479
	Static Stiffness	Universal testing machine	Measuring	1 samples for the total quantity under contract	≥ 450 kN/mm

Insulating Bush					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Material test report	Eye	Document review	1 per Instalment of supply	PA 6 or 6.6 Density 1,35 - 1,45 g/ cm³ Moisture content 1,0 - 2,5 %
	Tensile Test	Universal testing machine	Measuring	1 sample per Instalment of supply	Tensile strength ≥110 N/mm² Elongation at max Force ≥ 3 % according to DIN EN ISO 527
Insulating Bush	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Pieces or part thereof	
	Outside diameter				54 ±0,5
	Outside diameter				43,7 -0,5
	Inside diameter				28 +1
	Height				11 -0,5
	Height				24 ±0,5
	Radius				0,5 ±0,2
	Coaxial configuration				max. 2,0
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Density	Balance	Measuring	1 sample per 2,500 Pieces or part thereof	1,35 - 1,45 g/ cm³ according to DIN 53479
	Moisture content	Balance	Measuring	1 sample per 2,500 Pieces or part thereof	1,0 - 2,5 %
	Volume resistivity	Measuring device	Measuring	1 sample per Instalment of supply	≥ 10^{8} Ω cm according to DIN IEC 60093
	Shear modulus at 20°C	Universal testing machine	Measuring	1 sample for the total quantity under contract	≥1.500 N/mm² according to DIN EN ISO 6721

Elastic Pad					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Material test report	Eye	Document review	1 per Shipment	according to the order
Elastic Pad	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge)	Measuring	1 sample per 1,000 pads or part thereof	
	Length				387 ±3
	Width				155 ±3
	Distance of holes/ length				320 ±0,5
	Distance of holes/ width				90 ±0,5
	Diameter				32 +1
	Thickness				10 ±0,5
	Optical judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Static spring rate c stat between 18 and 68 kN	Universal Testing machine	Measuring	1 sample per 1,000 pads or part thereof	c_{stat} - 22,5 ±2,5 kN/mm
	Dynamic spring rate c stat between 18 and 68 kN by a frequency of 5 Hz				$c_{dyn} \leq 1,4 \times c_{stat}$
	Volume resistivity according to DIN IEC 60093/ for dry material	Measuring instruments	Measuring	1 sample per Shipment	$\geq 10^8$ Ω cm

Elastic Pad					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Elastic Pad	Fatigue test 1. Determination of static spring rate measured between 18 and 68 kN 2. Fatigue test with a load of 34 kN ±16 kN at a frequency of 8-10 Hz during 2,5 Mio.cycles 3. After fatigue test determin. Of static spring rate measured between 18 and 68 kN	Universal Testing machine	Measuring	1 sample for the total quantity under contract	Static spring rate after fatigue test ≤ 1,3 x static spring rate before fatigue test
	Tensile test (according to DIN 53455-6-4) before and after ageing in an oven during 168 h at 70°C	Tensile Testing Machine	Measuring	1 sample per Shipment	Tensile strength after ageing must be at least 80 % of tensile strength before ageing
	Water resistance according to DIN 53428		Measuring	1 sample for the total quantity under contract	Property change - Tensile strength and Elongation ≤ 20 %
	Oil and grease resistance according to DIN 53428 (ASTM - Oil No. 1 and Wheel flange grease)				
	Ozone resistance according to DIN 53509				

Collared Washer					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Material test certificate of the manufacturer	Eye	Document review	1 per instalment of supply	PA 6 or 6.6 Density 1,35 - 1,45 g/ cm³ Moisture content 1,0 - 2,5 %
	Tensile Test	Universal testing machine	Measuring	1 sample per instalment of supply	Tensile strength ≥110 N/mm² Elongation at max Force ≥ 3 % according to DIN EN ISO 527
Collared Washer	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 Washers or part thereof	
	Outside diameter				48,67 - 49,33
	Outside diameter				30,50 - 31,00
	Inside diameter				28,00 - 28,50
	Height				7,26 - 7,74
	Coaxial configuration				max. 2,0
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Density	Balance	Measuring	1 sample per 2,500 Washers or part thereof	1,35 - 1,45 g/ cm³ according to DIN 53479
	Moisture content	Balance	Measuring	1 sample per 2,500 Washers or part thereof	1,0 - 2,5 %
	Volume resistivity	Measuring device	Measuring	1 sample per instalment of supply	≥ 10^{8} Ω cm according to DIN IEC 60093
	Shear modulus at 20°C	Universal testing machine	Measuring	1 sample for the total quantity under contract	≥1.500 N/mm² according to DIN EN ISO 6721

Anchor Bolt					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the manufacturer	Document review	1 per heat	according to DIN EN ISO 898
Anchor Bolt	Dimensional check (Functional dimensions)	Measuring instruments (e.g. calliper gauge, projector)	Measuring	1 sample per 500 No. or part thereof	
	Total length				285 ±4,6
	Head width				> 48
	Head length				approx. 72
	Head thickness				10 ±1,5
	Shank diameter above the collar				27 ±0,84
	Shank diameter under the collar				27,0 - 29,0
	Length				135 +3
	Length				80 +6
	Straightness				max. 1
	Outside diameter	Gauge	Gauge measuring		M 27/ 26,352 - 27,000
	Pitch diameter				M 27/ 24,688 - 25,051
	Visual judgement surface	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Bending test	Bending machine	Measuring / Visual check	1 sample per 5,000 No. or part thereof	By a bending angle of 30° the bolt should not have any cracks
	Tensile test	Tensile machine	Measuring	1 sample per 5,000 No. or part thereof	Rm ≥ 830 N/mm² Re ≥ 660 N/mm² A ≥ 12 % according to DIN EN ISO 20 898
	Metalographic test Decarburization Non-metallic Inclusions	Microscope	Measuring	1 sample per Heat	 ≤ 0,015 mm ≤ 2.5 according ASTM (Reference test method)
	Analysis	Spectral analysis	Measuring	1 sample per Heat	according to DIN EN ISO 898
	Coating (hot dip galvan.)	Measuring instruments	Measuring	1 sample per 500 No. or part thereof	Coating thickness ≥ 55 µm

Helical Spring					
Sequence step	**Inspection characteristic**	**Test equipment**	**Testing method**	**Test Range**	**Nominal**
Raw Material	Analysis	Material test certificate of the wire rod manufacturer	Document review	1 sample per Shipment	According to DIN EN 10270 and DIN EN 10218
	Tensile Strength Percentage reduction of area	Universal testing machine	Measuring	1 sample per Shipment	>= 1710 N/mm2 >= 40%
Helical Spring	Dimensional check (Functional dimension)				
	Length	Measuring instrument	Measuring	1 sample per 2000 Springs or part thereof	56 +/- 1
	Outer diameter				48 +/- 0.6
	Inner diameter				32 +/- 0.6
	Material Diameter				8 +/- 0.035
	Visual Judgement	Eye	Visual check		Surface free of function-impairing cracks and damage/ form
	Spring Rate	Universal testing machine	Measuring	3 samples per shipment	212 N/mm according to DIN 20958
	Fatigue strength	Fatigue strength testing machine	Measuring	1 samples per shipment	≥ 3 million load cycles at an amplitude of 7.0 mm
	Coating (KTL)	Measuring instrument	Measuring	3 samples per shipment	Coating thickness ≥ 15 µm

ANNEXURE – 'B'

PERFORMANCE CRITERIA

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भारत सरकार
रेल मंत्रालय, (रेलवे बोर्ड)
नई दिल्ली-११० ००१
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)
NEW DELHI-110001

No. 2009/Proj/MAS/9/2. Dated 21-05-2010

General Managers,

All Indian Railways,
Director General
RDSO,
Lucknow

Sub: Performance Criteria of Fastening System for Ballastless Track

****

The Ministry of Railways has finalized the Performance Criterion of the fastening systems for ballastless track for Metro Railways/MRTS systems. These Performance Criterion will come into force with immediate effect.

Metro Railways/MRTS systems are free to choose fastening systems for ballastless track complying to these Performance Criterion.

They should however report the details of the fastening system adopted by them to the Ministry of Railways.

In· case, a new system is introduced in the country for the first time, the same will be kept under observation by RDSO for a period of two years in association with the concerned Metro railway/MRTS system.

In case any Metro railway or MRTS system wishes· to deviate from these Performance Criterion, prior approval of Ministry of Railways would be necessary

(Rajiv Chaudhry)
Executive Director Works(Planning
H 011-23386944

DA: Performance Criteria of Fastening System
for Ballastless Track on Metro Railways/MRTS
Systems (Provisional)

Copy to:
Secretary, Ministry of Urban Development, Nirman Bhawan, New Delhi -with a request to circulate this to the metro railways being co-ordinated by MoUD.

Ministry of Railways

PERFORMANCE CRITERION OF FASTENING SYSTEMS
FOR BALLASTLESS TRACK ON METRO RAILWAYS/MRTS SYSTEMS (PROVISIONAL)

1. Purpose:

The performance criteria define the performance standard of fastening system for ballastless track of Metro Railway System. Apart from other things, the fastening system is required to moderate vibration and noise transmitted through the rail and to reduce the track stiffness and the impact on the track structure, so as to obtain the parameters as detailed in the ensuing paragraphs.

2. Operating Environment:

Fastening system is expected to perform generally in the following conditions:

2.1 Gauge -Broad Gauge, 1676mm (nominal), standard gauge-1435mm.
2.2 Speed potential -110 kmph
2.3 Rail section -60 kg, UIC, 90 UTS, 110 UTS
2.4 Guard rail-Inner guard rail on viaduct and double/multiple line tunnels
2.5 Static axle load -BG & SG -20t (max.)
2.6 Design temperature range: -10 degree Celsius to + 70 degree Celsius (rail)

In addition, the client Railway may specify the other operating condition such as minimum radius of curve, super elevations, cant, ruling gradient & support spacing.

3. Ballastless Track Structure:

Track shall. be laid on cast in situ/precast reinforced plinth or slab, herein after referred to as the 'track slab'. The track slab shall be designed as plinth beam or slab type ballast less track structure with derailment guards. It shall accommodate the base plates of the fastening system. The minimum depth of concrete below the base plate should be decided based upon characteristics of underlying base and the design of the fastening system. In general, track slab on which the fastening and rail are to be fitted shall:

i. Resist the track forces.
ii. Provide a level base for uniform transmission of rail forces.
iii. Have geometrical accuracy and enable installation of track to the tolerances laid down.
iv. Ensure drainage.
v. Resist weathering.
vi. Be construction friendly, maintainable and quickly repairable in the event of a derailment. The 'Repair and Maintenance methods' shall be detailed in a Manual to be prepared and made available.
vii. Ensure provision for electrical continuity between consecutive plinths/slabs by an appropriate design.

3.1 Derailment Guards

The lateral distance measured perpendicular to between the running rail and the guard shall be 250 to 300 mm. It shall not be lower than 50 mm below the top of the running rail and should be clear of the rail fastenings to permit installation, replacement and maintenance. Derailment guard shall be designed such that in case of derailment:

1) The wheels of a derailed vehicle under crush load, moving at maximum speed are retained on the viaduct or tunnel.
2) Damage to track and supporting structures is minimum.

4 Performance Requirement of Fastening System:

4.1 General

1) The fastening shall be designed to hold the two rails of the track strongly to the supporting structure in upright position by resisting the vertical, lateral and longitudinal forces and vibrations.
2) The fastenings shall be with a proven track record. Fastening System should have satisfactory performance record of minimum five years in service in ballastless track on any established railway system. In this regard, supplier should submit certificate of performance from user railways administration including proof of use of the fastening system.
3) The fastening shall provide insulation to take care of return current of traction system.
4) Fastening should satisfy the required performance norms as stated in para 4.2, 4.3, 4.4 & 4.5.

4.2 Following are the technical performance requirements of fastenings:

The Fastening shall

i. Have design service life of 30 years in general. However, its components such as rubber pad, rail clip etc. can be designed for 300 GMT or 15 years whichever is less. Anchor bolts or studs used for fixing base plate to the concrete should not be required to be replaced during service life. Its components must not suffer any degradation during its service life to a degree so as to affect the performance and safety of the track. Full service life is to be attained under the following conditions:

   a. Atmospheric ultra violet radiation.
   b. Proximity of track up to 10m from ·salt water source.
   c. Contact with oil, grease or distillate dropped from track vehicles.

ii. Hold the rails to gauge and at the correct inclination within, tolerances laid down, against horizontal forces generated by vehicles in motion especially on curves, wheel set hunting, alignment and irregularities and thermal forces.

iii. Permit quick and easy installation and replacement with special tools.

iv. be capable of vertical Adjustment during service life up to 12mm using shims.

v. Permit the attainment of the following tolerances when installed, and later, during service.

vi.

SN	Parameter	Installation	Maintenance
1	Gauge	+2, -1 mm	+4, -2 mm
2	Cross level on straight track	±1.5mm	±5mm
3	Super elevation on curved track	±1.5mm	±3mm
4	Vertical alignment over a 20m chord on straight track	±3mm	±6mm
5	Lateral alignment over a 20 m chord on straight track	±2mm	±6mm
6	On curves -variation over the theoretical versine on 20m chord	±2mm	±5mm

vii. have dynamic / static stiffness ratio of 1.4 (max.) [Dynamic stiffness to be tested as per EN 13481 -5 Annex B. Ratio can be calculated by dividing the dynamic stiffness to static vertical stiffness (to be calculated as per S.No.2 of para 4.5)].

viii. Have clip toe load 18 kN per rail seat in service (i.e. even after creep etc.)

4.3 Where anchor bolts or studs are used for fixing the base plates, they shall have splayed ends. The designer of the rail fastening system shall submit detailed calculations to establish the diameter and number of anchor bolts / studs used as also the quality / grade of their steel, loads applied to the fastenings in operating conditions, factor of safety etc, Number of bolts to be provided on resilient base plate depend upon axle load, speed and radius of curve also, therefore, the supplier should indicate the proposed number of bolts per plate, as per the requirement of the location, along with calculations.

Anchor bolts shall be fixed rigidly in concrete. Fastener supplier shall specify the process to achieve this requirement

4.4 Fastening system (bonded or non-bonded) assembly shall be designed for static vertical stiffness of less than 35 kN /mm (in the secant range 5-80 kN) as a whole when tested using the specification **EN-13146-4: 2002 Railway application-track-test methods for fastening. Effect of repeated loading.**

4.5 The rail fastening system shall be tested to the following specification, for different technical parameters and should meet the acceptance Criteria as mentioned in the following table. **Any other similar test method needs approval of Indian Railway for the same parameters. Test** report of the reputed independent institute/laboratory will have to be submitted.

SN.	**Technical parameter**	**Test Method**	**Acceptance criteria**	**Remarks**
1.	Determination of longitudinal rail restraint	EN-13146-1 (latest version)	7kN (min.)	This has to be tested before repeated load test

2.	Vertical stiffness of complete fastening system	EN-13146-4 (latest version).	35kN/mm (max.)	No sliding, yield or cracking is allowed for the fastener parts.
3.	Determination of clamping force	EN-13146-7 (latest version).	18 kN (min.)	This has to be tested before repeated load test
4.	Determination of electrical resistance	EN-13146-5 (latest version).	5kΩ (min.)	The user may specify a higher value for use with certain track circuit
5.	Effect of severe environmental conditions	EN-13146-6 (latest version).	The fastening system shall be capable of being dismantled, without failure of any component, using manual tools provided for this purpose after exposure to the salt spray test	
6.	Effect of repeated loading	EN-13146-4 (latest version).	No wear or deformation	Test load & fastening position will be taken as per EN-13481-6.
6A	On Vertical stiffness	EN-13146-4 (latest version).	Variation less than 25% of the initial value	No sign of bond failure/fracture/ slippage.
6B	On Longitudinal rail restraint	EN-13146-1 (latest version).	Variation less than 20% of the initial value	Except the rail and fastener, no sliding yield or cracking is allowed for fastener parts. Longitudinal load/ deformation curve shall fall in the envelop of upper and lower limit which is to be submitted along with test report.
6C	On Clamping force	EN-13146-7 (latest version).	Variation less than 20% of the initial value	

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ANNEXURE – 'C'

DETAILS OF MANUFACTURING PLANT WHO HAS ALREADY SUPPLIED COMPONENTS OF FASTENING SYSTEM 336 SUCCESSFULLY TO USER RAILWAY ADMINSTRATION IN THE PAST

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Name of Component of Fastening System 336	**Name of Manufacturing Plant for Manufacturing of Components of Fastening System 336**	**No. of Components Already Supplied and Installed**	**Name of Client (User Railway Administration) telephone number and fax number**	**Contract Value (Rupees Equivalent INR as on 31.03.2016)**	**Certificate from User Railway Administration for already supplied and installed quantity**
Washer	**1.**				
	2.				
T-head Bolt with nut	**1.**				
	2.				
Rail Pad	**1.**				
	2.				
Collared Washers	**1.**				
	2.				
Insulating Bush	**1.**				
	2.				
Ribbed Baseplate	**1.**				
	2.				
Pad	**1.**				
	2.				
Anchor Bolt M27x285 with forged collar type having 11mm projecting & Hexagon Nut	**1.**				
	2.				
Tension Clamp Skl 12	**1.**				
	2.				
Helical Spring	**1.**				
	2.				
Elastomeric Pad	**1.**				
	2.				

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ANNEXURE – 'D'

DETAILS OF MANUFACTURING PLANT WHO HAS ALREADY SUPPLIED SIMILAR COMPONENTS AS THAT OF FASTENING SYSTEM 336 SUCCESSFULLY TO USER RAILWAY ADMINSTRATION IN THE PAST

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Name of Component of Fastening System 336	**Name of Similar Component in different ballastless track fittings**	**Name of Manufacturing Plant of similar components**	**No. of similar Components Already Supplied and Installed**	**Name of Client (User Railway Administration) telephone number and fax number**	**Contract Value (Rupees Equivalent INR as on 31.03.2016)**	**Certificate from User Railway Administration for already supplied and installed quantity**
Washer						
T-head Bolt with nut						
Rail Pad						
Collared Washers						
Insulating Bush						
Ribbed Baseplate						
Pad						
Anchor Bolt M27x285 with forged collar type having 11mm projecting & Hexagon Nut						

Note – Drawings/Dimensions & Specification of each similar component is required to be submitted by Bidder to authenticate the same.

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Section 6 – Employer's Requirement (ERQ)

(Particular Specifications)

Annexure – 3

TECHNICAL SPECIFICATION FOR TURNOUTS

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TECHNICAL SPECIFICATIONS OF STANDARD GAUGE TURNOUTS

1. General

1.1 On main lines, the turnouts shall be of the following types:

a) 1 in 9 type Turnout (ballastless)

1.2 All the turnouts shall be of UIC 60 or 60 E1, rails conforming to IRS-T-12-2009 and shall be designed for a Gauge of 1435mm.

1.3 All turnouts for ballastless track are to be laid on reinforced concrete slab.

1.4 The Bidder to indicate the name of the Metro Systems/Main line Rail networks where similar Turnouts, as mentioned in clause No.1.1 are in use with permissible speed in service.

The speed potential of the various turnouts will be equal to the main line speed for main line side & Speed potential for Turnout side shall be as given below:

(i) Main lines

a) 1 in 9 type turnout (Design speed 45 Kmph, permissible speed in service 40 Kmph.)

1.5 Turnouts on main lines shall be suitably designed by supplier, so as to take the LWR through turnouts.

1.6 All turnouts on main lines shall be laid with canted rails with an inward rail slope of 1 in 20.

1.7 Machining/Manufacturing tolerances of the turnouts shall be proposed by the supplier for Purchaser's approval.

1.8 All the UIC 60 or 60E1, 1080 HH grade rails (to be used for manufacturing stock rails, switch rails and also those required for welded leg extensions of CMS crossings) shall be manufactured and tested in accordance with IRS-T-12-2009 (with up to date amendments) specifications and shall be of class 'A' classification as per IRS-T-12-2009 specifications.

2.0 Basic Geometry of ballastless turnouts

The supplier shall be responsible for detailed design of all turnouts with the following basic geometrical parameters.

2.1 1 in 9 Turnouts

The design shall be with tangential entry. Switch entry angle in any case shall not exceed 0° 20' 00''. The radius of turnout shall be 300.000m with respect to centre line of track alignment through out. The distance between SRJ and actual toe of switch shall be 1570mm. The distance between SRJ and Intersection point shall be 17469mm. Over all length of the layout from SRJ to end of crossing including extended leg shall be 34260mm (measured along the straight). Spacing of bearing plates of Turnouts shall not be more than 600 mm except at few locations such as near point machine locations where it may be varied to meet the design requirements.

2.2 Switches

2.3 All switch rails on main lines shall be manufactured from suitable asymmetrical thick web rail section with prior approval of purchaser. The switch rail shall be one piece with no joint within the switch rail length.

2.4 All switches (stock rail & switch rail) shall be of 1080 grade Head Hardened (HH) in accordance with IRS-T-12-2009 (with latest amendment) specifications. Further these 1080 HH grade rails shall be suitable of being welded by short pre-heat process of alumino-thermic welding technique as specified in IRS-T-19 (latest version) for fusion welding of rails duly following the provisions of Indian Railway Manual for Alumino –Thermic welding.

2.5 Slide chairs in the switch portion shall be coated with an appropriate special coating with prior approval of the purchaser so as to reduce the point operating force and to eliminate the requirement of lubrication of sliding surfaces during service. The requirement and the extent of relief planning on the flange of tongue rails shall be determined and incorporated in the design by the supplier.

2.6 Switches shall provide adequate flange way clearance between the stock rail and the switch rail with the switch rail in open position. The minimum flange way clearance in switch portion shall not be less than 60 mm and the supplier shall provide second drive arrangements for 1 in 9 turnouts. The nominal opening of switch at toe of switch shall be kept as 160 mm.

2.7 The thick webbed tongue rails shall be forged at the end to enable its connection to the lead rail by short pre-heat Alumino Thermit weld.

2.8 In the switch portion, the stock rail shall be held down by the elastic fastenings on both sides of the flange of stock rail. The out side fastening clip shall be Fastening system 336 SKL-12, whereas the inside elastic clip shall be provided through suitably designed opening in the slide chairs to have a toe load of at least 1100 kg per elastic clip.

2.8.1 The switches shall be designed with an anti creep device at the heel of switch.

2.8.2 The switches & all slide chairs shall be same for ballasted & ballastless turnouts.

2.9 The Signalling work on the Lines (for which the supplies under this contract will be utilized) is planned to be executed under following contract:

Signalling Contract No.	Lines Covered	Details of Lines.
-	Main Lines	East-West Corridor of Jaipur Metro.

2.9.1 Signaling Contract:

The turnouts required for main Line covered under signaling Contract will be ballastless. For the details of point machines and locking arrangements to be used for turnouts of main line the supplier shall have to interface with designated signaling contractor. The point machines shall be any of the following types:

i) For Main Line with external mechanical lock (Non-Trailable)

- Alstom MJ 81 with VCC clamp lock.
- Cogifer MCEM 91 with VCC clamp lock.
- Siemens S700 K with Tempflex III or any other external lock.

- Bombardier JEA 74 with JEK 40 clamp lock.
- MD 2000 with external lock.
- Similar.

2.9.2 The supplier shall ascertain the exact distribution/break-up of turnouts (total quantities being as mentioned in Bill no SPM1 of Bill of Quantities) along with their types (LH/RH), required to be supplied under this contract duly approved by the purchaser.

2.10 The supplier shall be responsible for making detailed design & drawings for the fixation arrangements required on RCC Slab for point driving machines, second drive arrangement (for 1 in 9 turnouts) and any other arrangements required for fixation of signaling equipment duly interfacing with designated signaling contractor with prior approval of purchaser. Spring setting Device in lieu of second Drive Arrangement will not be accepted. The supplier has to do interface with civil agencies to check the necessary clearances etc for installation of turnouts.

2.11 The supplier shall also be responsible to make the provisions in switches (stock rail & tongue rail) for all the connections required for point driving machine, Clamp/Claw Lock, second drive (in case of 1 in 9 turnouts) and any other provisions required for connecting signaling equipment duly interfacing with designated signaling contractor with prior approval of the purchaser.

3.0 Crossings

3.1 All crossings for the main lines including diamond crossings shall be cast manganese steel crossing Ballastless Turnouts.

3.2 The cast manganese steel - crossings shall be manufactured from Austenitic Manganese steel as defined in UIC Code 866.

3.3 All CMS crossings on main lines shall have welded leg extensions of UIC 60, 1080 grade head hardened rails (IRS-T-12-2009, with latest amendment). This shall be achieved by flash butt welding of buffer transition rail piece of suitable thickness to CMS crossings and leg extension duly approved by purchaser.

3.4 All CMS crossings & their welded leg extensions for all scissors cross-overs shall be suitably dimensioned so as to eliminate the necessity of providing small cut rail pieces for the purpose of inter-connection. However, the need for providing site fabricated glued insulated joints from signaling requirement point of view shall be taken care of in the design duly interfacing with designated signaling contractor.

3.5 The wheel load transfer surfaces of all CMS crossings for main lines (ballastless turnouts) shall be artificially hardened by explosive hardening to achieve a minimum hardness of 340BHN before installation.

3.6 The provision of rail cant shall be taken care of on the top surface of the CMS crossings and the bottom surface of all CMS crossings shall be flat.

4 Check rails

4.1 The check rail section shall be 33 CI (UIC 33) or similar, without any direct connection with running rails except for diamond crossing, where suitable check rails/check blocks shall be designed & incorporated in the layout duly approved by the purchaser. Check rails in all turnouts & diamond crossings shall have facility for the adjustment of check rail clearances up to 10 mm over and above the initial

designed clearance. Each check rail end shall be flared by machining to have minimum clearance 62 mm at the end.

4.2 All the check rails shall be higher by 25 mm above running rails. The lengths and positions of the check rail in diamond crossings shall provide safety and be compatible with the overall track layout.

4.3 The check rail connections for all CMS crossings except for diamond crossings shall be through specially designed bearing plates / brackets.

4.4 The supplier shall provide the detailed design of check rail and wing rail gaps. A service tolerance of minimum 3 mm shall be provided in these clearances/gaps.

5 Turnouts (Ballastless)

5.1 The fixation of turnouts on RCC Slab shall be through base plates.

5.2 The fastening system for all turnouts shall be Fastening System 336 type with SKL-12 rail clips). The components of Fastening System 336 system shall be as mentioned below –

(i) Tension clamp SKL 12 (rail clip)

(ii) T-head bolt with Nut & Washer

(iii) 6mm thick EVA Rail Pad

(iv) Ribbed base plate

(v) Elastic base plate pad (10mm thick)

(vi) Intermediate EVA Pad (5mm thick)

(vii) Anchor Bolts (with 4 Anchor Bolts per base plate)

(viii) Insulating bush

(ix) Helical spring

(x) Collared Washer

(xi) Hexagonal Nut for Anchor Bolt

6 Interface

6.1 The Purchaser has appointed signalling contractors who will be responsible for designs & installation of signaling system**.** The supplier shall be required to interface with designated signaling contractor for all the information /details, required by him, pertaining to signaling installations /equipment for the detailed design of turnouts.

6.1 The design of all turnouts shall be suitable to be used in track circuited territory from insulation point of view.

6.3 The supplier shall be required to interface with designated Rolling Stock suppliers responsible for design and supply of Rolling stock and incorporate the wheel profile and other relevant parameters for the detailed design of turnouts.

7 Scope of Work

7.1 Turnouts (Ballastless)

The supplier shall be responsible for detailed design & drawings of turnout & scissors cross-over as per Clauses 1 to 9 of Technical Specifications of Turnouts and Scissors X-overs including all fittings, fastening, fixtures, various blocks, base plates /special base plates, brackets, stretcher bars (other than leading stretcher bar) & their connections, check rails, rail pads, elastic base plate pads, intermediate pads, washers, nuts & bolts**,** second drive arrangement for 1 in 9 turnout & scissor cross-over, switches, crossings, etc. complete duly interfacing with the designated signaling contractor.

7.1.1 Scope of supply

1) The supplier shall be responsible for manufacturing & supply of switches (stock rail & tongue rail), CMS crossings with welded leg extensions, check rails, slide chairs, base plates, special base plates, brackets, all fittings & fastenings, fixtures., rail pads, intermediate pads, elastic base plate pads, washers, all stretchers bars (except leading stretcher bar) with its fixtures, various blocks, bolts & nuts, second drive arrangement with its fittings for 1 in 9 turnout & for scissors cross-over, any special fitting etc. complete, for the complete turnout from SRJ to BOC except the item mentioned in sub clause 8.1.1(2).

2) The supplier shall not be required to supply rails other than those required for welded leg extensions of CMS crossing & Switches. Fittings & Fastenings for entire Turnout including Lead Rail Portion will be under scope of supply.

3) Supplier will submit a complete component list for complete turnout having all the components according to 7.1.1(1) & 7.1.1(2)

7.1.2 The supplier will provide installation procedure to track installation agency & The supplier shall be responsible for deployment of requisite track expatriate to guide & witness of atleast 01 set of each type of turnout etc. Information regarding schedule date of installation of turnout etc shall be provided shall be provided by purchaser atleast 15 days in advance.

7.1.3 The supplier will submit detail design & drawing including design calculation for each turnout type following necessary interface with Rolling stock, signaling, civil & track installation agency in 05 sets for Purchaser's approval. Availability of Supplier's technical expert will be required during consideration of their design submissions. Any modification in drawing during execution of contract must be approved by Purchaser.

Following Purchaser's approval of design submissions, the supplier will submit QAP & ITP as per UIC 866 including dimensional check sheets for Purchaser's approval. Inspecting agency will be nominated by JMRC & inspection scope will be complete including stage inspection as per standard norms. Supplier's manufacturing unit will provide all necessary tools, equipments & help to inspecting agency to perform inspections.

7.1.4 The supplier will ensure Proto arrangement of each Turnout type following necessary interface with concerned signaling & installation agencies. On Successful Inspection clearance of Proto turnouts, supplier will go for further production.

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Section 6 – Employer's Requirement (ERQ)

(Particular Specifications)

Annexure – 4

TECHNICAL SPECIFICATION FOR RAILS

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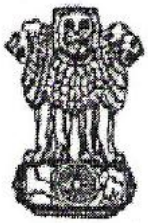
भारत सरकार

Government of India

रेल मंत्रालय

MINISTRY OF RAILWAYS



सत्यमेव जयते

भारतीय रेल मानक विशिष्टि

INDIAN RAILWAY STANDARD SPECIFICATION

समतल आधार रेलों के लिये

FOR FLAT BOTTOM RAILS

IRST-12-2009

अअमासंRDSO
रेल अग्रदूत Transforming Railways
www.rdso.gov.in

अनुसंधान अभिकल्प एवं मानक संगठन लखनऊ . 11

Research, Design and Standards Organisation, Lucknow-11

IRS-T-I2-2009

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SERIAL NO. T-12-09

This specification was initially adopted in 1934 and subsequently revised in 1939, 1950, 1953, 1955, 1958, 1960, 1964, 1988 and 1996.

The present version has been adopted in 2009 specifying the requirements of the Prime rail and IU rails having ultimate tensile strength (UTS) of 880 MPa, 1080 MPa CR and 1080 MPa HH .This specification also specify the requirements of special class of rail steel such as Niobium (NB), Vanadium (VN), corrosion resistant rail steel Copper Molybdenum (CM), Nickel Chromium Copper (NC)

1. SCOPE

This specification applies to Flat bottom Railway Rails. It specifies quality of the steel, manufacturing process, chemical composition, acceptance tests/ retests, qualifying criteria and other technical conditions of supply.

2. RAIL SECTION

The Section of the flat bottom rails shall be in accordance with the section profiles shown in Appendix-I, II, IIA, III, unless otherwise specified by the purchaser.

3. TEMPLATES AND GAUGES

The manufacturer shall submit, at his own expenses, two sets of templates (internal and external) made of stainless steel for each section of rail ordered or contracted for as per approved drawings. Two sets of plus and minus limit gauges made of stainless steel, in accordance with the stipulated maximum and minimum tolerances, shall also be submitted for approval of the Purchaser or his Authorised Inspecting Agency. The approval of purchaser or his authorised inspecting agency shall be obtained before the rolling of rails is commenced. The templates and gauges shall be stamped by the Purchaser/Authorised Inspecting Agency as a token of approval.

One set of templates of plus and minus limit gauges (called hereinafter master gauges) shall remain in possession of the Purchaser/Authorised Inspecting Agency during the period of acceptance. Only gauge bearing the stamp of the Purchaser/Authorised Inspecting Agency shall be valid for checking purpose.

Each template/gauge shall be suitably engraved with the manufacturer's name and the number of the rail section together with such other marks as the Inspecting Agency or the purchaser may direct.

4. DEFINITIONS

4.1 Sequence-continuous casting

This term is used when a sequence of casts of the same grade of steel is poured through a continuous casting machine without interruption in flow of liquid steel into the moulds and strands. The pouring of the next cast from ladle into the tundish begins before the steel from the previous cast is completely poured off from tundish to the mould, leading to an inter-mixing of some liquid steel from the two successive casts.

4.2 Main cast

Blooms that are known to be entirely composed of steel from the same liquid steel melt.

4.3 Changeover, Overlap or Intermediate Bloom

Blooms that may contain steel from more than one cast i.e. material arising during the Changeover from one cast to the next in the sequence. Number of change over bloom will be mutually decided by manufacturer/Purchaser depending upon casting practice adopted by the manufacturer.

4.4 Classification of rails

52 kg/m , 60 kg/m ,68 kg/m & ZU-1-60 rails shall be classified as class 'A' and class 'B' based on tolerance in end straightness as specified in Clause 9.4.2.

5 MANUFACTURE

5.1 The steel used for the manufacture of rails shall be made by basic oxygen or electric arc furnace process and continuously cast. Any other method of casting shall have prior approval of the Purchaser. For molten steel secondary ladle refining is mandatory. The manufacturer in his offer shall furnish details of the steel making process including refining, vacuum degassing.

5.2 The cross sectional area of the bloom shall not be less than ten times that of the rail section to be produced.

5.3 The manufacturer shall apply the best accepted code of practice throughout manufacturing process to ensure that the rails meet the stipulations of this specification. The manufacturer shall, on request, inform the purchaser of the measures adopted for ensuring the above.

5.4 For head hardening, rails should be suitably heat treated to meet the requirements of this specification. The method of heat treatment adopted by the manufacturer should be made available to the purchaser and prior approval of the purchaser shall be taken before execution of the order.

6 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser shall provide the following information to the supplier when inviting tender for supply of rails according to this specification:

i) Rail steel grade (Table 1)
ii) Rail Section profile (Appendix I to III)
iii) Class of rail
iv) Length of rail.
v) Undrilled or drilled rails ends.
vi) Colour code requirements (Appendix IV)

7 GRADE, CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

The steel for rails shall be of fully killed quality and shall conform to chemical composition and mechanical properties given in Table 1. These limits for chemical composition are applicable both for tests on ladle samples and for check analysis of finished rails. The ladle and check analysis of the steel, when carried out by the method specified in the relevant part of IS: 228 or any other established instrumental/chemical method, shall be as specified in table-1.In case of any dispute, the procedure given in the relevant part of IS: 228 shall be referred to Table 1.

8 MARKING

8.1 Brand Marks

Brand marks shall be rolled in relief on one side of the web of each rail at least every 3.0 meters. The brand marks on the rails shall be clearly legible and shall be rolled in letters in relief at least 20mm in height and minimum 1.0 mm above surface of the web of the rail.

The brand mark shall include:

a) The rail section.

b) The grade of steel, i.e.

Grade 880	-	880
Grade 1080 HH	-	1080 HH
Grade 1080 Cr	-	1080 CR
Grade 880 Cu-MO	-	880 CM
Grade 880 Ni Cr Cu	-	880 NC
Grade 880 Vanadium	-	880 VN
Grade 880 Niobium	-	880 NB

c) Identification mark of the manufacturer

d) Month (using roman numbers) and last two digits of year of manufacture.

e) Process of steel making: -

i) Basic oxygen - O

ii) Electric - E

TABLE-1

Grade	Chemical Composition (percentage)										Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	V (max)	10^{+4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength ***(MPa)(Min.)	Elongation % on gauge length – $5.65\sqrt{S_o}$ (min)	Running surface hardness (BHN)
880	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	-	1.6 ppm	880	460	10.0	Min 260**
1080 Cr	0.60-0.80	0.80-1.20	0.50-1.10	0.025	0.025	0.004	0.20	0.80-1.20	0.20	20	1.6 ppm	1080	560	9.0	320-360
1080 HH	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	-	1.6 ppm	1080	460	10.0	340-390

So = Cross sectional area of tensile test piece in mm^2
* 0.035 maximum for finished rail
The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.
** Desirable Value.
*** Frequency to be mutually agreed by purchaser and manufacturer.

SPECIAL RAIL STEEL

TABLE 1 –Contd...

Grade	Chemical Composition (percentage)											Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	V (max)	Nb (max)	10^{4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (Min)	Elongation % on gauge length – 5.65√So (min)	Running surface hardness (BHN)
NIOBIUM (NB)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	0.04	-	1.6 ppm	880	540	10.0	Min 260**
VANADIUM (VN)	0.60-0.80	0.80-1.30	0.10-050	0.025*	0.030*	0.015	-	-	0.20	-	20	1.6 ppm	880	630	9.0	Min 260

CORROSION RESISTANT RAIL STEEL

Grade	Chemical Composition (percentage)											Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	Cu	Ni	10^{4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (MPa)(Min.)	Elongation % on gauge length – 5.65√So (min)	Running surface min hardness (BHN)
Copper- Molybdenum (CM)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.2-0.3	-	0.25-0.35	-	-	1.6 ppm	880	460	10.0	260
Nickel Chromium Copper (NC)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.25	0.50-0.65	0.3-0.4	0.25-0.40	-	1.6 ppm	880	520	10.0	260

So = Cross sectional area of tensile test piece in mm^2

* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.

8.2 Hot Stamping

Each rail shall be identified by a numerical, alphabetical or combined alphabetical and numerical code which will be distinctly hot stamped at least once every 4.0m on the web in figures and letters at least 15mm high from which following information can be obtained:

i) The number of the cast from which the rails has been rolled with letter 'C'
ii) Number of the strand.
iii) For rails from change over bloom, cast number should be the preceding cast number with prefix letter 'B'.

8.3 Cold Punching

8.3.1 Following should be cold punched on one of end face of each rail

a) Inspecting Agency Id and Group ID
b) Shift No in which product inspected
c) Date of Inspection

8.3.2 For IU rails

In addition to marking mentioned in this Specification, the letter "IU' (Industrial Use grade) as the case may be in 15 mm size shall be stamped on both end faces of rails.

8.4 Colour code

Rails shall be painted as per colour code given in Appendix-IV to distinguish grade, class, length and other special requirements. Paint of good quality should be used with the prior approval of the Inspecting Agency.

9 SECTIONS AND DIMENSIONS

Each section of rails shall be accurately rolled to its respective template within the tolerances specified in this clause.

9.1 Permissible Variations in Dimensions

The tolerances in sectional dimensions shown here under shall be allowed, provided,

For Prime quality rail the actual weight computed by weighing short pieces of rails, not less than 300mm each in length, shall fall within 0.5 percent below and 1.5 percent above the calculated weight shown in Appendix I, II and III for each rail section.

For IU Rail the actual weight computed by weighing short pieces of rails not less than 300 mm each in length is not less than the calculated weight shown in Appendix I ,II, II-A & III of this specification for each section of rail by more than 1.5%.

9.1.1 Tolerances in sectional dimensions (For Prime Quality rails)

Dimention	Tolerance	Remarks
Overall Height of Rails	+0.8 mm -0.4 mm	
Width of Head	± 0.5mm	This will be measured 14mm below the rails top
Width of flange	± 1.0mm	For section less than 60Kg/m
	+1.2 mm -1.0 mm	For sections 60kg and above
Thickness of web	+1.0 mm -0.5 mm	This will be measured at the point of minimum thickness
Verticality/Asymmetry	± 1.2mm	Measured by gauge shown in App. V)
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

9.1.2 Tolerances in sectional dimensions (for IU rails)

Dimension	Tolerance	Remarks
Overall Height of Rails	+2.0 mm -1.0 mm	
Width of Head	+2.0mm -2.0mm	This will be measured 14mm below the rails top
Thickness of web	+2.0 mm -1.0 mm	This will be measured at the point of minimum thickness
Width of flange	+1.5 mm -2.0mm	
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

All other requirements as regards variation in dimensions, length and falling weight test shall be as per Prime Quality rail (Para 9.1.1).

9.2 Length of rails

The standard length of rails shall be 13m or 26m. However, in case rails are to be procured in longer lengths, the same shall be prescribed by the purchaser.

The manufacturer shall be entitled to supply in pairs short lengths up to 10% by weight of the quantity contracted for or ordered. Such shorter lengths shall not be less than 10.0 m in lengths for standard length of rails of 13m and shall not be less than 24 m

in lengths for standard length of rails of 26m. The short lengths shall be in multiples of 1.0m.

Type of Rail	Tolerance in length	
Prime Quality Rail	+20 mm	-10 mm
IU Grade	+30 mm	-30 mm

9.3 End Squareness

The deviation from square in both horizontal and vertical directions shall not exceed 0.60 mm on a length of 200mm.

9.4 Straightness

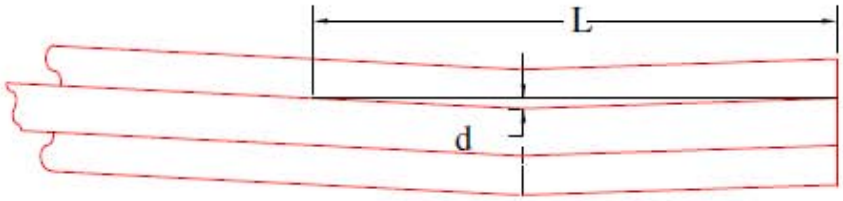
9.4.1 The straightness of the whole rail shall be judged by naked eye but in case of doubt or dispute, the affected portion shall be checked using 1.5 meters straight edge. The maximum permissible deviation shall be 0.7mm measured as the maximum ordinate on a chord of 1.5m. Wavy, kinky and twisted rails shall not be accepted.

9.4.2 End Straightness

The tolerances for end straightness shall be as indicated in Table 2 and as illustrated in figure 1 and 2.

Table –2

Sl. No	Straightness	Tolerance		
		Class 'A' rails	Class 'B' rails	I U Grade rails
1.	**Horizontal**	Deviation of 0.5 mm measured as maximum ordinate from the chord of 2.0 meters standard straight edge.	Deviation of 0.7 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge	Deviation of 1.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge
2.	**Vertical a) Up sweep**	Deviation of 0.4 mm measured as maximum ordinate from the chord of 2.0 meters standard straight edge.	Deviation of 0.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge.	Deviation of 1.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge.
	b)Down Sweep	NIL	NIL	NIL



L= Length of straight edge specified in Table 2
d= Maximum tolerance specified in Table 2.

Fig.1 TOP VIEW OF HORIZONTAL TOLERANCE AT RAIL ENDS

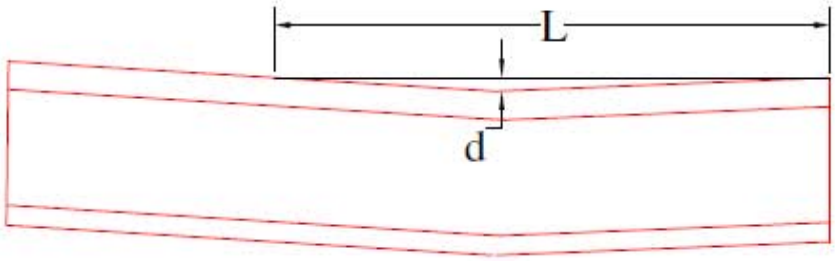


Fig.2: SIDE VIEW OF VERTICAL TOLERANCE AT RAIL ENDS

Any rail not complying with these requirements may be rectified once by the Manufacturer and offered for re-inspection.

10 FREEDOM FROM DEFECTS

10.1 The rails shall be free from all detrimental defects such as cracks of all kinds, flaws, piping or lack of metal etc. having an unfavorable effect on the behavior of the rail in service.

10.2 The absence of harmful internal defects shall be ensured by the continuous on-line ultrasonic examination. This examination shall be carried out for all rails under the responsibility of the manufacturer to the satisfaction of the Inspecting Agency.

10.3 The manufacturer in his offer shall furnish the detailed method of on-line ultrasonic testing of rails to be followed by him. The limits of permissible defects for ultrasonic testing of rails shall be as follows and the standard test piece shall be as shown in appendix-VI.

Head	:	1.5 mm dia through hole
Web	:	2.0 mm dia through hole
Web & foot junction	:	2.0 mm dia through hole
Foot	:	0.5mm deep, 12.5mm long and 1.0mm wide notch (inclined at 20° with vertical axis)

All Flash Butt Welds executed by the manufacturer for welding of rails in to long panels shall be subjected to ultrasonic testing along with other acceptance criteria as per provisions of Manual for Flash Butt Welding of Rails .

10.4 EDDY CURRENT TESTING:

The manufacturer should have eddy current testing covering bottom area of the rail as also the top surface and sides of surface head. The ECT probes should cover complete area of rail bottom and at least 80% area of top surface and sides of the head. The system should be capable of detecting the defects more than or equal to 0.5 mm depth and more than 10 mm long.

10.5.1 SURFACE QUALITY

10.5.1.1 Surface quality for Prime Quality Rail

10.5.1.2 Hot marks

Depth of rolling guide marks anywhere on the rail should not exceed 0.5mm. A maximum of two guide marks are allowed per rail. The width of each rolling guide mark should not exceed 4.0mm.

Depth and width of guide marks must conform to the following:

Depth	Minimum width	Maximum width
mm	mm	mm
0.5	1.5	4.0
0.4	1.2	4.0
0.3	0.9	4.0

10.5.1.3 Cold Marks

Depth of longitudinal or transverse cold formed scratches anywhere on the rail should not exceed 0.5mm.

10.5.1.4 Seams

Rails with seams greater than 0.2 mm in depth are not acceptable and shall be ground. On the running surface of the rail, dressing shall be limited to 0.3mm deep and in other places; it shall be limited to 0.5 mm deep.

10.5.2 Surface Quality for IU rail

The rails shall be of uniform section throughout and shall be generally sound and free from twists, cracks and major surface defects.

The following maxima of dimensions of surface defects in the rail shall, however, be acceptable:-

Type of defect	Location	Permissible dimensions of defects
Seams	(a) Table of rails, side of the head of rail, bottom and side of the foot of rail (excepting middle third of the foot). (b) Middle third of the bottom surface of the foot of the rail.	Up to 3mm in depth Up to 2mm in depth
Scabs	Table of rail and side of the head of the rail.	75 mm x 25 mm not to exceed 3 mm in depth.

Number of scabs shall not be more than 3 in the standard rail lengths and shall be separated from each other by at least six times the length of the scab. There shall be no scab within 200mm from the end of the rail.

10.5.3 Protrusions

All protrusions in the head or foot of the rail shall be ground to match the parent contour. Protrusions on web greater than 1.5mm high and 20mm square shall be ground. All protrusions affecting the fitment of the fishplate shall be ground.

10.6 During examination on the inspection banks, any shrinkage cavity, inclusion & segregation visible to the naked eye shall result in rejection of such rail or cutting out of the defective portion and re-examination.

10.7 Any operation carried out either in the hot or cold state with the object of hiding a defect is strictly forbidden.

11 Finishing

11.1 Cold straightening shall be effected by means of gradual pressure without impact. The rails may be roller straightened only once in each direction. The markings must be protected from the action of the straightening rolls.

11.2 The rails must be cut to length when cold. Burrs shall be removed without any perceptible beveling of the section.

12 TESTING FACILITIES

The manufacturer shall, at his own expense, supply all templates and gauges, prepare and supply test pieces and sample of steel, sample rails and drillings, and supply

labour and apparatus/equipment, for testing which may be required by the Inspecting Agency for carrying out all the tests and render reasonable assistance in execution of such tests as desired by the Purchaser/Inspecting Agency.

13 QUALIFYING CRITERIA

The following test shall be done for each rail section, grade and class after any change in the process of manufacture which may affect the results or annually for first three years after adoption of the revised specification. If results of these three years are consecutively found satisfactory, this frequency may be relaxed to three years by Purchaser. The test shall be undertaken by the supplier to demonstrate compliance with the qualifying criteria. If so desired, the purchaser /Inspecting Agency should be provided all facilities to check the sample and witness the test.

a) Residual stress measurement.
b) Fracture toughness measurement
c) Fatigue test

The samples for these tests shall be collected from finished rails. These samples shall not be subjected to any further mechanical or thermal treatment. The tests shall be carried out by an accredited/recognised laboratory approved by the purchaser and the test results shall be reported to the purchaser. The purchaser shall have access to all test records, calibrations and calculation which contribute to the final results.

In case any sample fails to meet the requirement laid in the qualifying criteria the manufacturer shall review its process of manufacturing within six months to eliminate any shortcomings and fresh qualifying criteria test shall be undertaken under intimation to the Purchaser.

14 NATURE OF TESTS

All tests shall be carried out as per latest version of reference specifications mentioned in this document.

14.1 ACCEPTANCE TESTS

14.1.1 Following acceptance tests shall be conducted for Grade 880, 1080 CR , 880 CM, 880 NC, 880 VN & 880 NB Rails:

a) Chemical Analysis
b) Tensile Test
c) Sulphur Print
d) Hardness test (for information and record)
e) Falling Weight Test
f) Hydrogen content
g) Inclusion Rating Level

14.1.2 For Grade 1080 Head Hardened (1080 HH) Rails all the tests stipulated in Para 14.1.1 above shall be conducted except tensile test and hardness test, prior to heat treatment. Following tests shall be carried out after heat treatment:

a) Tensile Test
b) Hardness Test
c) Macroscopic Test

14.2 The choice of the test sample location within the cast and strand shall normally lie with the manufacturer. The test sample position within the bloom/rail shall be selected at the discretion of the Inspecting Agency.

14.3 The initial test pieces and also the samples intended for retest must not be taken from the change over or intermediate blooms. Tests will only be carried out on these blooms when part or the whole of the adjacent cast has been withdrawn as not conforming to specification, or for supplying supplementary information, if required by the purchaser.

14.4 The test methods and the conditions, under which the tests are carried out, shall conform to the standard in force in the country of manufacture, in so far as they are not defined in the present specification.

15 TEST SAMPLE

15.1 The samples drawn for preparation of the test pieces shall be marked and stamped under the supervision of the Inspecting Agency.

15.2 If during the preparation of test pieces, any marks have been removed, they shall be replaced on the actual test pieces in the presence of the Inspecting Agency.

15.3 The test pieces shall be machined in the cold state and must not be subjected to any cold or hot working or heat treatment except for stress relieving treatment at 100° C for two hours for tensile test pieces at the option of the manufacturer.

16 CHEMICAL ANALYSIS

16.1 The manufacturer shall, at his own expense, make a complete ladle sample analysis of each cast from which the rails are to be rolled and shall submit an authenticated copy of the results to the Inspecting Agency in the proforma at Appendix-VII. The percentage of each specified element shall conform to the limits specified in table-1 of clause 7.

16.2 Extent of test (Product)

For casts	≤	150t, one test per cast.
For casts	>	150t, two tests per cast, one sample taken from first half of the cast and the other from the second half and different strand.

16.3 If chemical analysis of any cast fails to conform to the provisions of clause 7, the cast shall be subjected to the retest as per provisions of clause 16.4.

16.4 Retest

Two additional chemical analyses shall be made. If both analyses pass, the casts shall be considered as complying with clause 7. If one or both of the analyses fail, the cast shall be rejected.

16.4.1 If a cast does not satisfy the conditions of the specification, the intermediate metal belonging to preceding and succeeding cast shall be rejected or subjected to a retest.

16.5 The chemical analysis for specified elements shall also be made either from drillings taken from a hole drilled in the rail, or by spectrography or any other approved method from the position shown (in fig.3), rolled from the same cast or from the tensile test piece or piece selected by the Inspecting Agency and the percentage of each specified element shall be within the range specified in table 1 of clause 7.

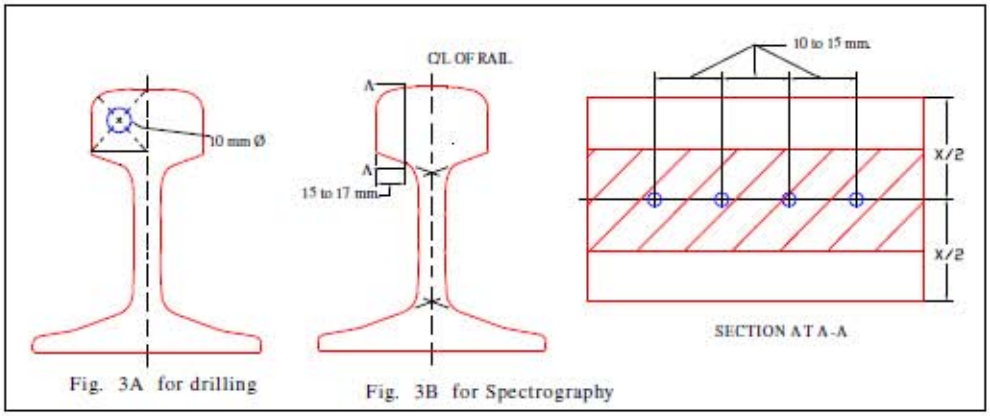


Fig. 3A for drilling

Fig. 3B for Spectrography

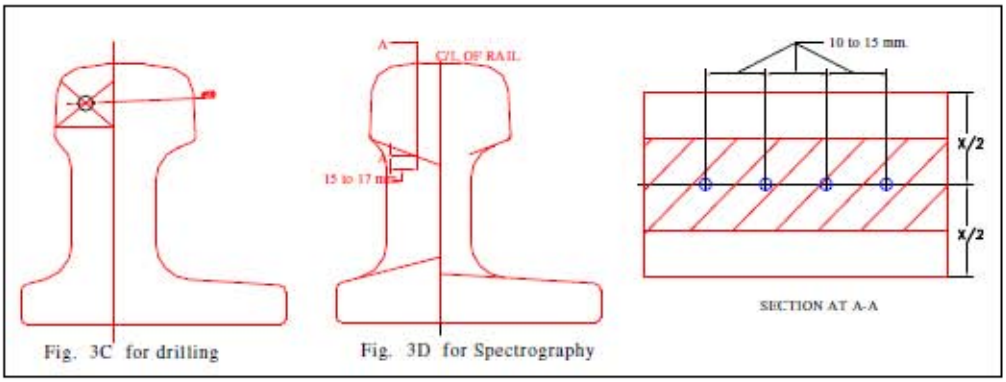


Fig. 3C for drilling

Fig. 3D for Spectrography

Fig. 3 Location Of Sample For Chemical Analysis

17 TENSILE TEST

17.1 For 880,1080 CR , 880 CM, 880 NC, 880 VN, And 880 NB grade Rails:

17.1.1 Nature of Tests

The manufacturer shall determine the tensile properties of the steel in accordance with the requirements of IS: 1608. Such tests shall be made on standard test pieces taken from position shown in figure 4.

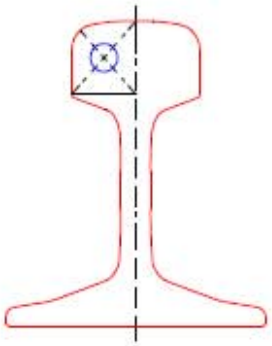


Fig .4 LOCATION OF TENSILE TEST PIECE

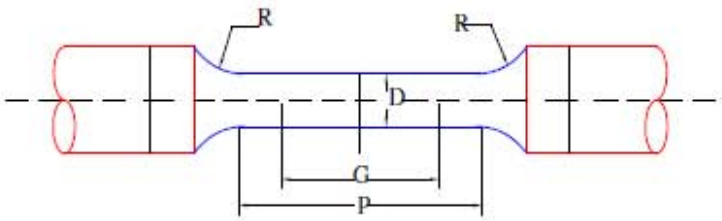


Fig . 5 STANDARD ROUND TENSILE TEST PIECE

Three sizes of the standard test piece, as shown in fig.5 are given in table 3, any of which may be adopted.

Table-3

Diameter	Area of cross section	Gauge length	Parallel length	Radius at Shoulder
D mm	A mm^2	G mm	P mm	R mm
20.64	333.33	100	120	18
14.56	166.67	75	90	13
10.00	78.50	50	55	10

17.1.2 Extent of Tests

For casts	≤	150t, one test per cast.
For casts	>	150t, two tests per cast, one sample taken from first half of the cast and the other from the second half and different strand.

17.1.3 Results to be obtained

The tensile strength obtained shall not be lower than the minimum value given in table 1, clause 7. Should the test piece break outside the middle half of the gauge length , it may be discarded and such breaks should not be considered as a failure of the test. A fresh test or fresh tests may be made by the manufacturer with a test piece or test pieces taken from rail from the same cast from which the discarded test piece was taken.

17.1.4 Retests

When the first tensile test does not give satisfactory result, three retests shall be made. The two retests shall be made on any of the rails from the same strand and the third retest on any of the rails from another strand of the same cast.

The check tests must not be carried out on rails produced from intermediate blooms of a sequential continuous cast.

If all the three retests are satisfactory, all the rails of the cast shall be accepted.

If any of the two retests from original strand does not give satisfactory result and the third retest from the other strand gives satisfactory result, all the rails of the original strand shall stand rejected and rest of the rails of the cast shall be accepted.

If third retest does not give satisfactory result, further retest shall be made strand by strand as above up to 50% of strands.

For sequential continuously cast material, in the event of rejection or withdrawal of rails from one or more strands of a cast, the rails rolled from the change over blooms between the ends of these strands of the previous and next cast in the sequence shall either be deemed not to comply with the requirements or shall be subjected to retest which shall be carried out, one on rail from the strand represented by the original test and the other from another strand. In the event of failure of either of these retests, rails rolled from change over blooms shall be rejected.

17.2 For 1080 HH (Head Hardened) Grade Rails

17.2.1 Nature of Test

The manufacturer shall determine the tensile properties of the steel in accordance with the requirements of IS: 1608.
Such test shall be made on standard test pieces taken from position as shown in fig.6 given below.

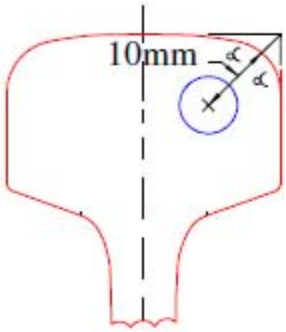


Figure -6

The diameter of the test piece shall be 6 mm with gauge length 3.54D or 21 mm.

17.2.2 Extent of Tests

One test per 1000 meter of heat treated rail from one heat.

17.2.3 Results to be Obtained

The minimum tensile strength after heat treatment shall not be less than 1080 MPa with a minimum elongation of 10% and 0.2% proof stress shall be measured and record maintained. If the test piece breaks outside the middle half of the gauge length, it may be discarded and such breaks shall not be considered as failure of the test. A fresh test or fresh tests may be made by the manufacturer with a test piece or test pieces taken from a rail from the same lot from which discarded test piece was taken. If the tests fail to meet the above requirements, the rails may be retreated at the option of the manufacturer and such rail may be retested as above.

18 Sulphur Print Test

18.1 For Grade 880/1080 Cr/1080 HH /880 CM/ 880 NC/ 880 VN & 880 NB Rails

18.1.1 Nature of test

A Baumann-type impression is obtained by the application of bromide paper, previously impregnated with a solution of Sulphuric acid, to the clean rail sections drawn from a location within the cast at the discretion of the Inspecting Agency.

The sections intended to be used for these tests are cold sawn and are then sufficiently cleaned on one surface in order to eliminate completely all machining marks and to obtain a sharp impression.

The initial samples and also those intended for the retests must not be taken from rails of changeover blooms. Tests will only be made on these rails when part or whole of the adjacent cast has been withdrawn as not conforming to specification.

18.1.2 Extent of Tests

Sulphur print tests shall be carried out at the rate of one each per cast for casts ≤ 150 t and two per cast for casts > 150 tones.

18.1.3 Results to be Obtained

The prints obtained must not reveal macrographic defects more marked than those of the limit prints shown in (or equivalent to those shown in) the album of macrographic prints given in Appendix-VIII.

18.1.4 Retests

If Macrographic examination (Sulphur print) conducted according to 18.1.3 does not give satisfactory results, three further samples, two from the same strand and one from the other strand shall be tested.

If all the retests are satisfactory, all the rails of the cast shall be accepted.

If any of the two retests from the original strand does not give satisfactory result but the third retest from the other strand gives satisfactory result, all the rails of the original strand shall stand rejected and rest of the rails of the cast shall be accepted.

If the third retest from the other strand does not given satisfactory result, further retest shall be conducted strand by strand.

For rails from sequential continuously cast blooms, in the event of rejection or withdrawal of rails from one or more strands of a cast as a result of macrographic test, the rails rolled from the change over blooms at the end of these strands of the next cast in sequence shall either be deemed not to comply with requirements or shall be subjected to retest which shall be carried out one on the rails from the strand represented by the original test and the other from any other strand. In the event of failure of either of these retests, the rails rolled from change over blooms shall be rejected.

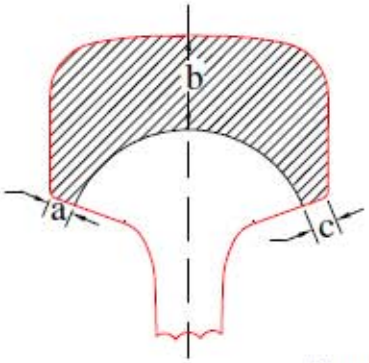
18.2 Inclusion Rating Level

18.2.1 The inclusion rating level, when examined as per IS: 4163, shall not be worse than 2.5 A, B, C, D thin or 2.0 A,B,C,D thick. Reporting for a parameter is to be in either thin series or thick series.

18.2.3 This test shall be done once every day at random .The record of the test results shall be communicated to purchaser.

18.3 Macro-Structure Test (For 1080 HH grade Rails)

One macro structure test of hardened layer per 1000 meter of heat treated rails shall be performed. Macro structure of heat affected zone shall confirm to figure 7.



a,c	>=	10 mm
b	>=	15 mm

Figure -7

19 Brinell Hardness Test

19.1 For 880/1080 CR ,880 CM, 880 NC, 880 VN & 880 NB Rails

19.1.1 Nature of Test

For carrying out this test, impression shall be made on the running tread of a test piece drawn at the discretion of the manufacturer. The test shall be performed in accordance with IS: 1500.

19.1.2 Extent of Test

Test on 10% of the casts shall be carried in case of 880 grade rails and 1080 grade rails for the purpose of records and for any corrective action as required. The hardness values should preferably be as under:

Grade 880 rails	Minimum 260 BHN
Grade 1080 HH	340 - 390 BHN
Grade 1080 Cr	320- 360 BHN

Results of the test should be average of five observations on the same test piece.

19.2 For 1080 Grade (Head Hardened) Rails

19.2.1 Nature of Test:

The hardness test on the rail head surface shall be carried out for 10% of rails, at one end of the rail (after removing the decarburised surface), at regular interval of heat treatment and the hardness should be in the range of 340-390 BHN for 1080 HH Grade Rails. In case of non-conformance of any rail, 9 consecutive rails on either side of the rails having non- conformed value shall be checked for hardness in the sequence. Rails

not meeting the hardness stipulations maybe retreated only once at the option of the manufacturer and such rails may be retested as above."

19.2.2 Results to be obtained:

Hardness of rail head surface after heat treatment shall be within Brinell Hardness No. 340 to 390.

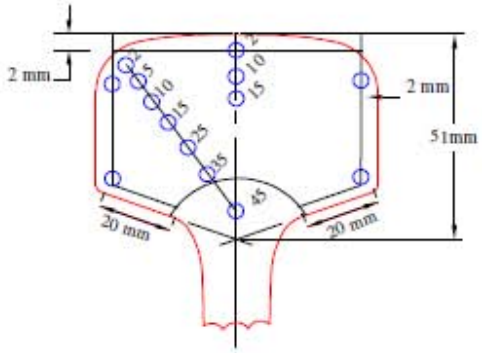


Figure -8 Hardness Distribution

19.2.3 Hardness Distribution Test

The hardness distribution test shall be conducted on transversely cut rail sections as shown in figure 8. Hardness value at any point shall not exceed 390BHN. The cross sectional hardness distribution of heat treated rails shall slope towards the inside. No sharp drop in hardness should be present. The hardness at 10 mm below, the rail head table at centre shall be 340 BHN minimum.
The hardness at 15 mm below, the rail head table at centre shall be between 315-325 BHN.

19.2.4 Extent of Test:

One hardness distribution test per 1000 m length of heat treated Rail shall be performed.

19.2.5 Microstructure :

Test piece for microstructure should be taken from the top of rail head. Test piece should be polished, etched and viewed under microscope X100 and X500 magnification. The microstructure shall be fine pearlite without formation of any martensite and Bainite. One test per 1000m of heat treated rail from one heat to be carried out.

20. FALLING WEIGHT TEST

20.1 Nature of Test

20.1.1 Falling weight test piece 1.5 meters long shall be cut from a location as per choice of the Inspecting Agency. For heat treated rails, the sample shall be taken after heat treatment. The test piece shall be placed in horizontal position with the head up on two iron or steel supports resting on a solid metal anvil. The weight of the metal anvil block shall not be less than 12 t and the area of the base not less than 4.2 sq.m. The

metal anvil block shall be supported direct on a concrete or masonry foundation weighing not less than 25 metric tons and having an area of not less than 9.3 sq.m. No timber or spring shall be permitted between the rail supports and the anvil or between the anvil and the foundation. Block guides shall be provided which shall permit free fall of the weight. The upper surface of the supports shall be curved to a radius of not more than 75mm.

One blow shall be delivered midway between the supports, by means of a freely falling iron weight or 'TUP', the striking face of which shall be rounded to a radius of not more than 125mm. the weight of the "TUP", the distance between the centre of the bearings , the height between the surface of the rail and the bottom of the "TUP", before the latter is released shall be as specified in table-4.

Table-4

Rail Section	Weight of Tup (kg)	Distance between centers of bearers (m)	Height of drop (m)
52 kg	1270	0.85	6.4
60kg	1270	0.85	7.4
ZU-1-60	1270	0.85	7.4
68 kg	1270	0.85	8.4

20.2 Extent of Tests

One Test per cast shall be carried out. Sample for 20% (minimum) of the fresh casts rolled per day shall be selected at random from straightened rails and the remaining samples shall be hot sawn. No retest shall be permitted on account of sample from straightened rails failed in Falling weight test. However, present provision of retests shall be applicable to rest 80% of samples taken from un-straightened rails. Choice of the test sample location within cast and strand shall normally lie with the manufacturer. The test sample position within bloom/ rail shall be selected at the discretion of the inspecting agency.

20.3 Results to be Obtained

20.3.1 The blow shall be sustained without fracture, and the permanent set resulting from the blow shall be measured after every test, over the specified distance between the centers of the bearer and recorded and advised to the purchaser.

20.3.2 The Inspecting Agency shall be entitled to test to destruction any rail piece subjected to the falling weight test or carry out any other test/examination/analysis in order to confirm that the rails are sound.

20.4Retest

Test sample shall be selected at random from the finished rails at the discretion of the Inspecting Agency.

If a falling weight test piece gives unsatisfactory result, three retests shall be made on two rails from the same strand and one from any other strand. If all the three tests are satisfactory, all the rails of the cast shall be accepted.

If either of the two tests from original strand gives unsatisfactory result and the third test from the other strand gives satisfactory results, all the rails of the original strand shall be rejected and other rails of the cast shall be accepted.

If the third test from the other strand gives unsatisfactory result, further retest shall be conducted strand by strand. For sequential continuous cast, if rails are rejected or withdrawn from one or more stands of a cast, the rails rolled from the changeover bloom at the end of the same strands of the previous and next cast in the sequence shall either be withdrawn or subjected to two retests, failure of either of retest shall result in rejection of the rails rolled form the changeover blooms of the same strand.

21 DETERMINATION OF HYDROGEN CONTENT

Vacuum degassing of liquid steel shall be done to reduce the hydrogen content. For this purpose RH degasser shall be used. The vacuum level and the duration for which liquid steel shall be kept under this vacuum level shall be decided mutually by the purchaser and the manufacturer. All measurement of hydrogen shall be done for the liquid steel in tundish or mould. Any other method of sampling or determination of hydrogen will require prior approval of the purchaser.

21.1 The measurement of hydrogen shall be done by following method:

21.1 (a) On-Line/Instantaneous Method-

HYDRIS is approved as method of on-line instantaneous measurement. The method of measurement as prescribed by the manufacturer of HYDRIS system shall be adopted with approval of the purchaser. Any other alternate method of determination of hydrogen will require prior approval of the purchaser.

(b) Pin Sample Method-

In case, the manufacturer has not installed the facility for on-line/instantaneous facility for measurement of hydrogen as described in Para (a) above, this method may be adopted with prior approval of the purchaser.

In this method, sample of liquid steel shall be taken by plunging the sampler 300 mm below the molten slag-metal interface. The sample should be held for 2 to 3 seconds and then quenched in cold water so that sample temperature falls to below 150^0C within 5 seconds.

The sample should be removed from cold water and packed in dry ice if analysis is carried out within 48 hours of sampling or placed in liquid nitrogen if analysis is to be carried out beyond 48 hours after sampling. Sampling should be done by 6 mm dia vacuum tube of Pyrex glass with wall of thickness of 1.0mm and approximately 0.5 mm thick in the fill-end. The tube should have desired vacuum of 10^{-3} mm of Hg.

The hydrogen sample can be analysed by inert gas fusion technique in which sample is to be fused at approximately 1900^0 C in an induction heating graphite crucible. A nitrogen carrier gas transports the released hydrogen to thermal conductivity cell. The amplified and integrated output of the cell is to be calibrated for hydrogen in ppm.

LECO – RH –2 Hydrogen Analyser may be used for Hydrogen determination.

Any other size and material of tube and method of hydrogen determination will require prior approval of the purchaser.

21.2 The level of hydrogen measured by the method described under Para 21.1 above shall be as under for acceptance of a heat for production of rail:

i) When measured by the method described under Para 21.1 (a) = 1.6 ppm max.
ii) When measured by the method described under Para 21.1 (b) = 2.0 ppm max.

22 QUALIFYING CRITERIA TESTS

22.1 Residual Stress Measurement

22.1.1 Residual stresses are measured by attaching electrical strain gauge at various locations on the rail surface. The surfaces to which the strain gauges are attached are progressively isolated from the rail and the relaxed strain are then used to estimate the stresses which have been relieved whilst the original residual stresses are taken to be these values but with a change of sign.

22.1.2 Procedure of Measurement of Residual Stresses

A test piece of 1.0 m length shall be cut from the sample rail. A 150 mm long area in the centre of the test piece shall be ground by hand using fine stones. During grinding it shall be ensured that the surface does not get overstressed. Final finishing shall be done using emery-paper. Strain gauges shall be fixed on minimum 7 & 12 locations on the rail as shown in figure 9.

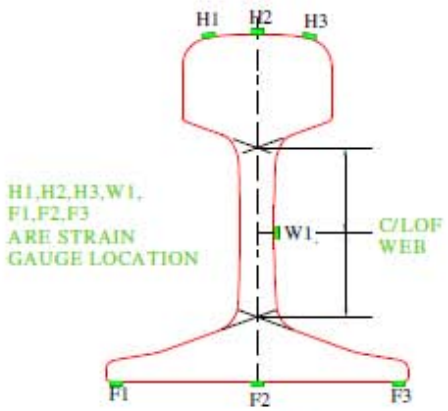


Fig 9-A

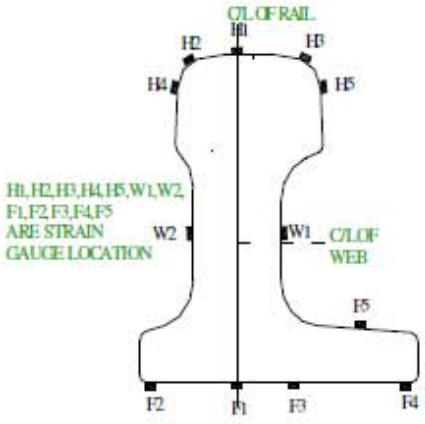


Fig 9-B

Figure 9 : Location of strain Gauges to measure surface longitudinal residual stresses

The strain gauge location shall be accurately marked and these locations shall be cleaned with the help of Acetone and cotton. Rust shall be cleaned by acid and the acid cleaned locations shall be treated by basic solutions. Strain gauges shall be fixed using

proper adhesive and then connecting wires and terminals are soldered. Null balancing of strain shall be done and reading of each strain gauge brought to zero using balancing bridge and strain indicator. The wires shall be disconnected from the balancing bridge and 60 to 80 mm length of samples shall be cut containing all the strain gauges. Wires shall be connected to the balancing bridge and reading of strain gauge taken using same setting of balancing bridge as was before cutting the samples. The reading of strain at the corresponding locations shall be converted to stress by multiplying with Young's modulus of elasticity for steel (2.05×10^6 Kg/cm^2). Residual stress will have same value as relieved stress with opposite sign.

22.1.3 Results to be obtained

Residual tensile stress anywhere in the rail section shall not exceed 190 MPa, anywhere in the section.

22.2 Fracture Toughness K_{1c}

22.2.1 Test pieces and test methods

Tests shall be performed in accordance with **APPENDIX-XI**

22.2.2 Qualifying Criteria:

The values of K1c shall comply with table given below:

Steel grade	Minimum single value K_{1c}(MPa m ½)	Minimum Mean K_{1c}(MPa m ½)
880	26	29
1080 Cr	24	26
1080 HH	30	32

Note: In some circumstances K_Q values can be used for the purpose of qualification – see B.6 of appendix XI.

22.3 Fatigue Test

22.3.1 The constant amplitude fatigue test shall be carried out in accordance with ASTM E606.

22.3.2 Test Pieces

The test pieces shall be machined from the sample rail at a location at least 2m from the rail ends.

22.3.3 Number of Tests and Test Conditions

A minimum of three tests shall be performed under the following conditions:-

Test temperature = Ambient

Control variable shall be axial strain amplitude.

Note:- Load control during the test is acceptable provided the requirements of ASTM E606, clause 10.2.1 are complied with.

The strain cycle shall be symmetrical about the initial zero load strain level.

22.3.4 Each sample should endure 10 million cycles at strain of 0.00135. For rails of Grade 1080 HH the each sample should endure 10 million cycles at strain of 0.00166.

23 INSPECTION

23.1 The purchaser/Inspecting Agency shall have free access to the works of the manufacturer at all reasonable times. The Inspecting Agency shall be at liberty to inspect at every stage the process of steel manufacture and rail production and cross check the results of the stipulated tests when so desired by it.

23.2 Rails rolled from passed heats only shall be inspected by the Inspecting Agency or as mutually agreed by purchaser and Inspecting Agency . The acceptance procedure should not interfere with the normal manufacturing process. When a cast is rolled in several batches, tests carried out on the first part of the cast may be considered valid for the remaining parts of the cast in agreement with the Inspecting Agency.

23.3 Before the rails are submitted to the Inspecting Agency, these rails shall be properly examined by the manufacturer's inspectors and all defective rails shall be conspicuously marked and segregated. Rails passed in internal inspection should only be offered for examination by the Inspecting Agency.

23.4 The analysis of all casts rolled together with a report on the manufacturer's rejections shall be submitted in proforma as appendix IX and X to the Inspecting Agency.

23.5 After inspection, every accepted rail shall be clearly stamped with the Inspecting Agency's stamp at one end in the presence of the Inspecting Agency and painted as per colour code specified in clause 8.4. Cast numbers shall be cold stamped on the faces of the rails at one end.

23.6 Passed rails should be properly stacked on leveled and well drained stacking area. Rails shall be stacked in head up position with 100 x 25mm mild steel flats as spacers at a distance of 3.0 meters between successive layers.

23.7 For lifting rails, single point slinging is not permitted. For 13m long rails, there should be two lifting point spaced at 6 to 7.5 m apart and the maximum rail end overhang beyond the lifting point should not be more than half of the distance between the lifting point. For lifting longer rails the spacing between lifting points shall not be more than 7.5 m. Lifting of rails using magnetic chucks shall be preferred.

23.8 Sudden impact on rails during loading, unloading, stacking or transferring from one point to the other shall be avoided.

24 METHOD OF PAYMENT

24.1 The calculated weights of rails given in appendix I , II , II-A and III of this specification shall be regarded as actual weights and payment shall be made on these weights unless otherwise agreed to.

25 SHIPMENT

25.1 No rail shall be loaded or dispatched until notification has been received from the Inspecting Agency that it has been inspected and has satisfactorily passed all specified tests.

25.2 Industrial Use (IU) rails should be loaded in one wagon and should not be mixed with other rails for dispatch.

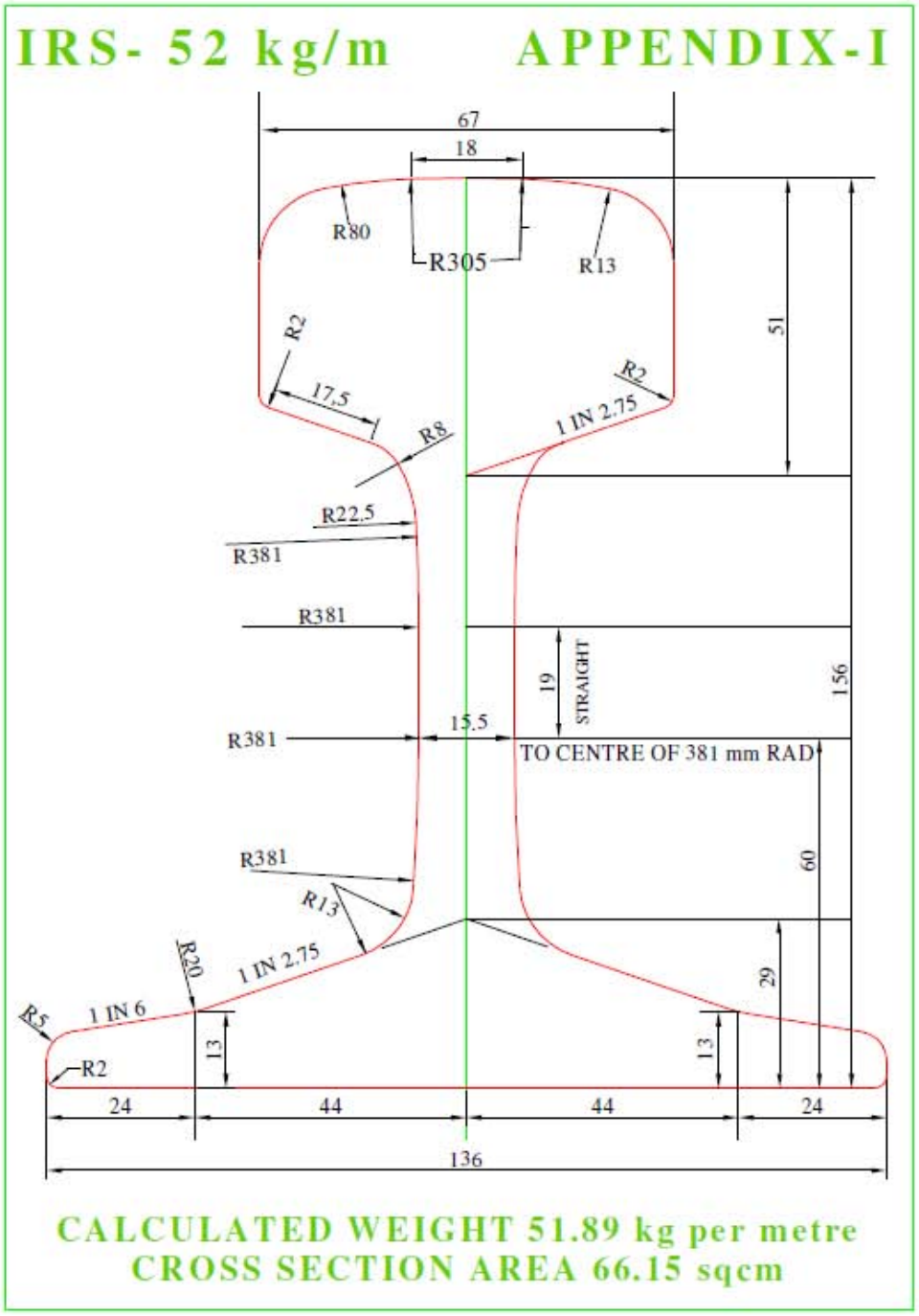
25.3 Import Shipment

The rails shall be loaded in bundles of three rails each bundle containing one rail upside down placed in between two rails snugly fitting and suitable tied by M.S. straps at four or more places along the length of rails so that they will not get loosened during their transportation from manufacturer's place to site of work.

25.4 Rail Transport

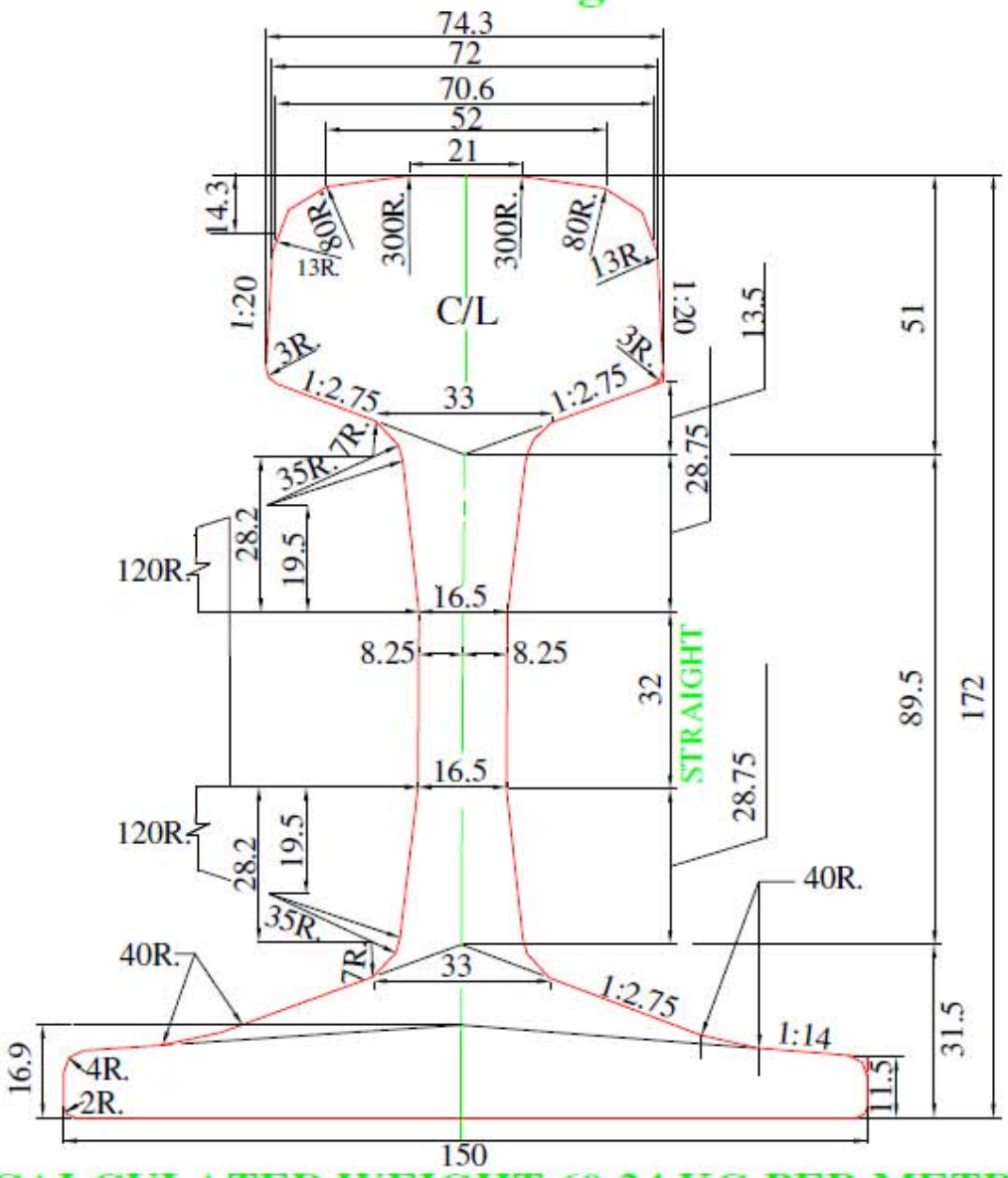
Transportation within the country

Rails shall be loaded in wagons in layers with wooden/steel spacer flats between them so that the rails do not get damaged during transportation. Any missing bolster in BFRs/BRHs/BRNs shall be replaced by the manufacturer at his expense. The rails shall be tied as per the extant instructions.


IRS- 52 kg/m APPENDIX-I
67
18
R80
R305
R13
R2
17.5
R8
R2
1 IN 2.75
51
R22.5
R381
R381
R381
19
STRAIGHT
156
15.5
TO CENTRE OF 381 mm RAD
R381
R13
R20
1 IN 2.75
60
29
R5
1 IN 6
R2
13
13
24
44
44
24
136
CALCULATED WEIGHT 51.89 kg per metre
CROSS SECTION AREA 66.15 sqcm

APPENDIX-II

UIC 60 kg/m

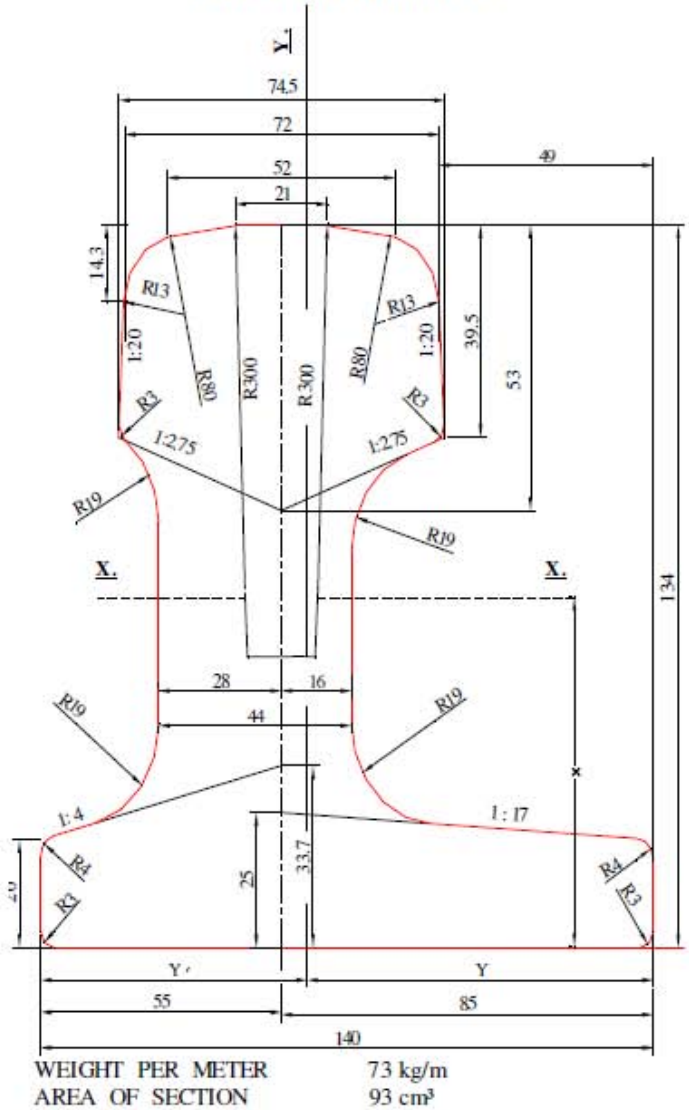


CALCULATED WEIGHT 60.34 KG PER METRE

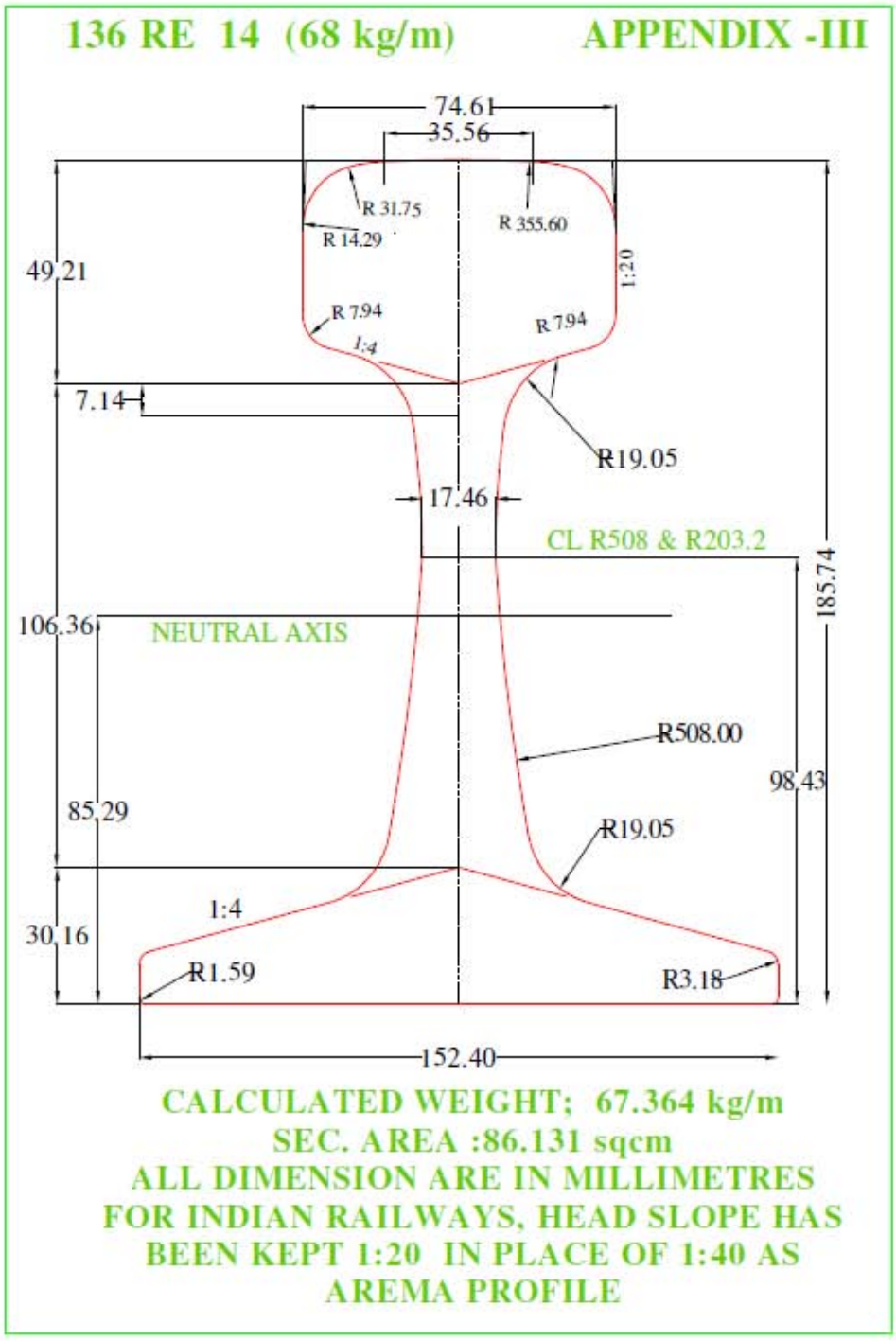
CROSS SECTION AREA 76.86 sqcm

APPENDIXX II-A

ZU 1-60 PROFILE



WEIGHT PER METER 73 kg/m
AREA OF SECTION 93 cm²


136 RE 14 (68 kg/m)
APPENDIX -III
74.61
35.56
R 31.75
R 14.29
R 355.60
1:20
49.21
R 7.94
1:4
R 7.94
7.14
R19.05
17.46
CL R508 & R203.2
185.74
106.36
NEUTRAL AXIS
R508.00
98.43
85.29
R19.05
1:4
30.16
R1.59
R3.18
152.40
CALCULATED WEIGHT; 67.364 kg/m
SEC. AREA :86.131 sqcm
ALL DIMENSION ARE IN MILLIMETRES
FOR INDIAN RAILWAYS, HEAD SLOPE HAS
BEEN KEPT 1:20 IN PLACE OF 1:40 AS
AREMA PROFILE

IRS-T-12-2009

APPENDIX – IV

COLOUR CODE FOR RAILS

S. No.	Grade	Colour Code	13m, 26m, 130m, 260m	12m, 25m, 129m, 259m	11m, 24m	10m
1	GR. 880	Only common length wise colour code and no paint on web surface				
2	GR.1080 H.H.	In addition to common length wise colour code, **Blue** paint on both sides of web surface for a distance of 500 mm from each end.				
3	Gr 1080 Cr	In addition to common length wise colour code, **Green** paint on both sides of web surface for a distance of 500 mm from each end.				
4	CLASS 'A' RAIL	In addition to common length wise colour code, grade code as 1, 2 & 3 and **Green** paint on gauge/non gauge face for a distance of 500 mm from each end.				
5	NIOBIUM 880 NB	In addition to common length wise colour code, **Purple** paint on both sides of web surface for a distance of 500 mm from each end.				
6	VANADIUM 880 VN	In addition to common length wise colour code, **Yellow** paint on both sides of web surface for a distance of 500 mm from each end.				
7	Copper-Molybdenum 880 CM	In addition to common length wise colour code, **White** paint on both sides of web surface for a distance of 500 mm from each end.				
8	Nickel Chromium Copper 880 NC	In addition to common length wise colour code, **Brown** paint on both sides of web surface for a distance of 500 mm from each end.				
9	IU	In addition to common length wise colour code, **Blue** paint on end face of flange and both sides of flange for a distance of 500mm from each end.				

Common lengthwise colour code

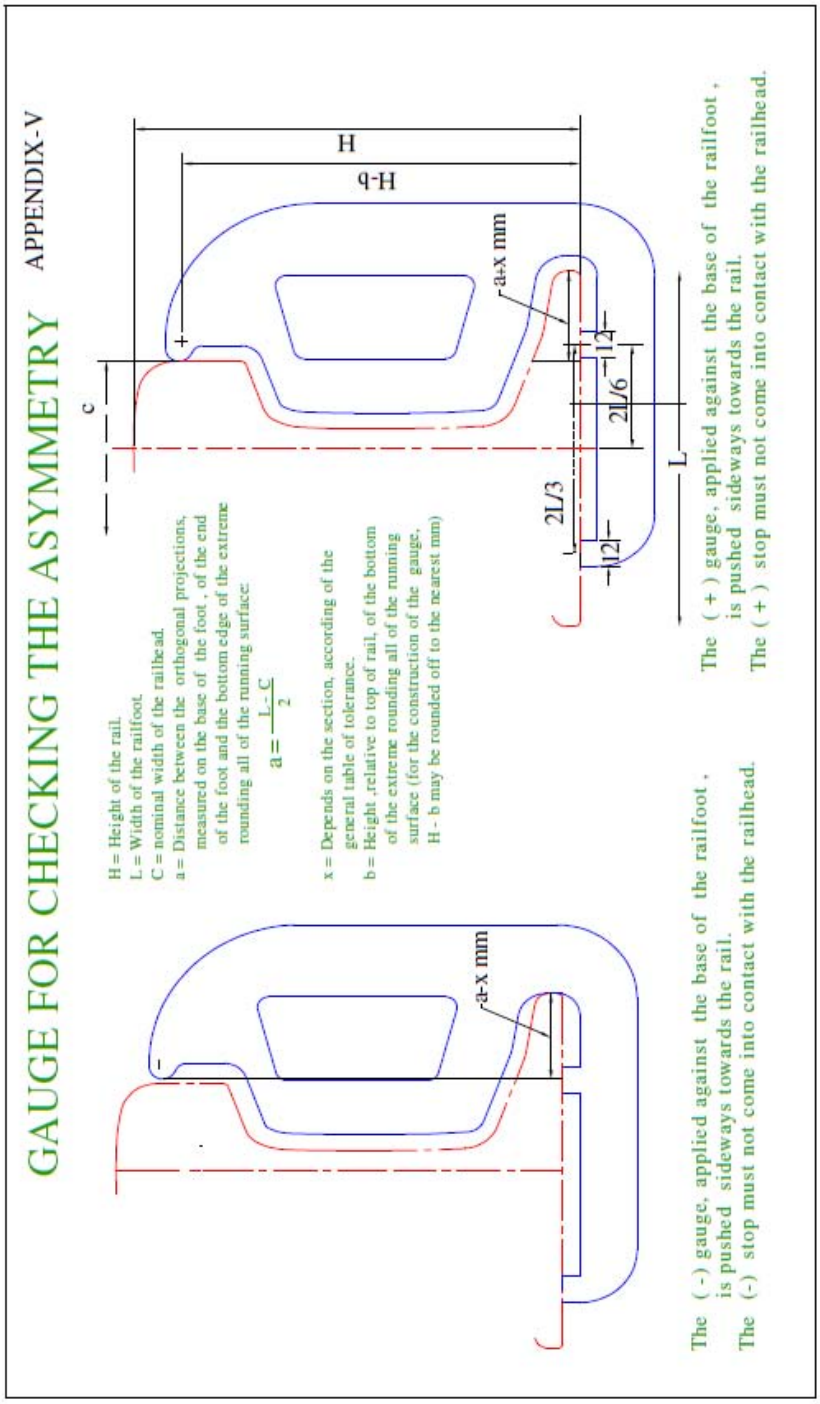
1. No paint on gauge/non-gauge face indicates class 'B' rails.
2. Yellow paint on each end face on web region indicates **13m, 26m, 130m, and 260m** length.
3. Blue paint on each end face on web region indicates **12m, 25m, 129m, and 259m** length.
4. White paint on each end face on web region indicates **11m, 24m** length.
5. Green paint on each end face on web region indicates **10m** length.

Note: - This colour code is for new rails, for second hand rails Para 321 of IRPWM-1986 may be referred to.

32

APPENDIX-V

GAUGE FOR CHECKING THE ASYMMETRY



H = Height of the rail.
L = Width of the railfoot.
C = nominal width of the railhead.
a = Distance between the orthogonal projections, measured on the base of the foot , of the end of the foot and the bottom edge of the extreme rounding all of the running surface.

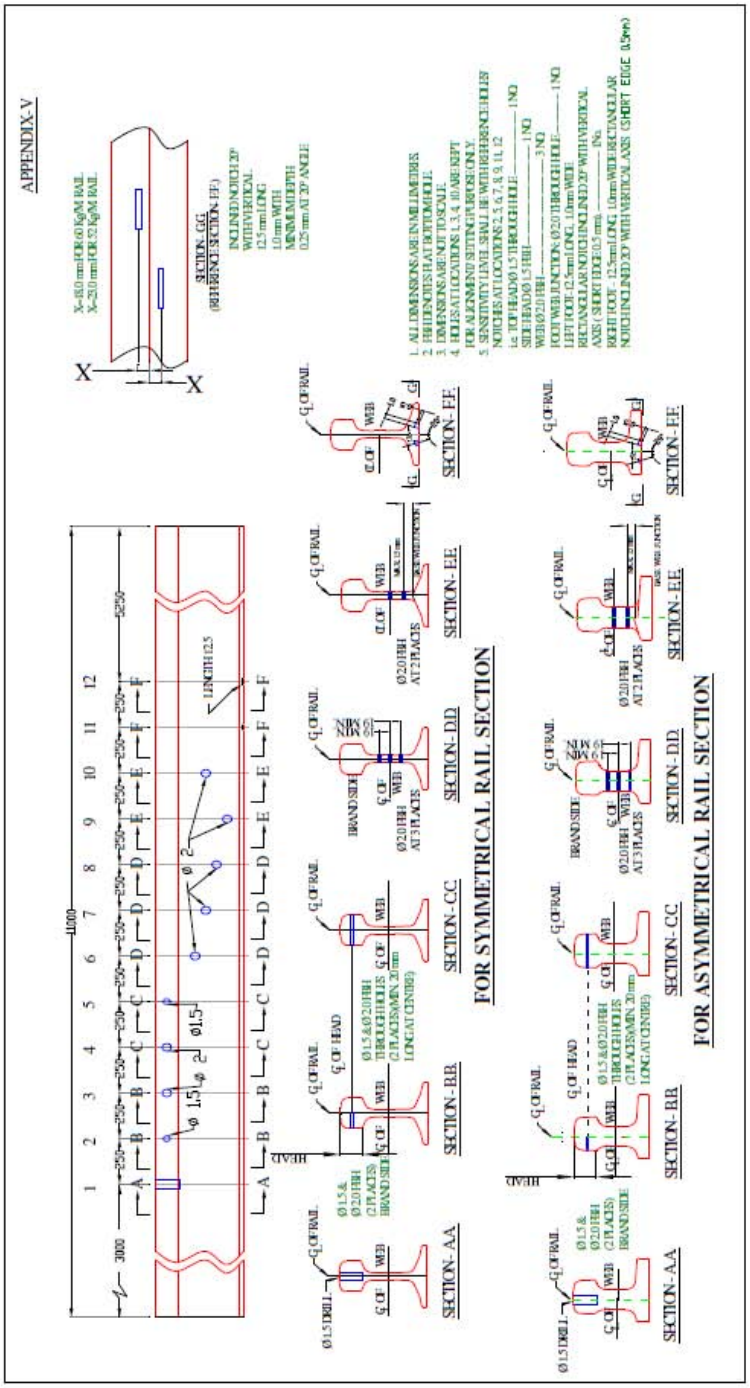
$$a = \frac{L - C}{2}$$

x = Depends on the section, according of the general table of tolerance.
b = Height ,relative to top of rail, of the bottom of the extreme rounding all of the running surface (for the construction of the gauge, H - b may be rounded off to the nearest mm)

The (+) gauge, applied against the base of the railfoot , is pushed sideways towards the rail.
The (+) stop must not come into contact with the railhead.

The (-) gauge, applied against the base of the railfoot , is pushed sideways towards the rail.
The (-) stop must not come into contact with the railhead.

IRS-T-12-2009



34

IRS-T-I2-2009

APPENDIX- VII

LADLE ANALYSIS OF RAIL STEEL

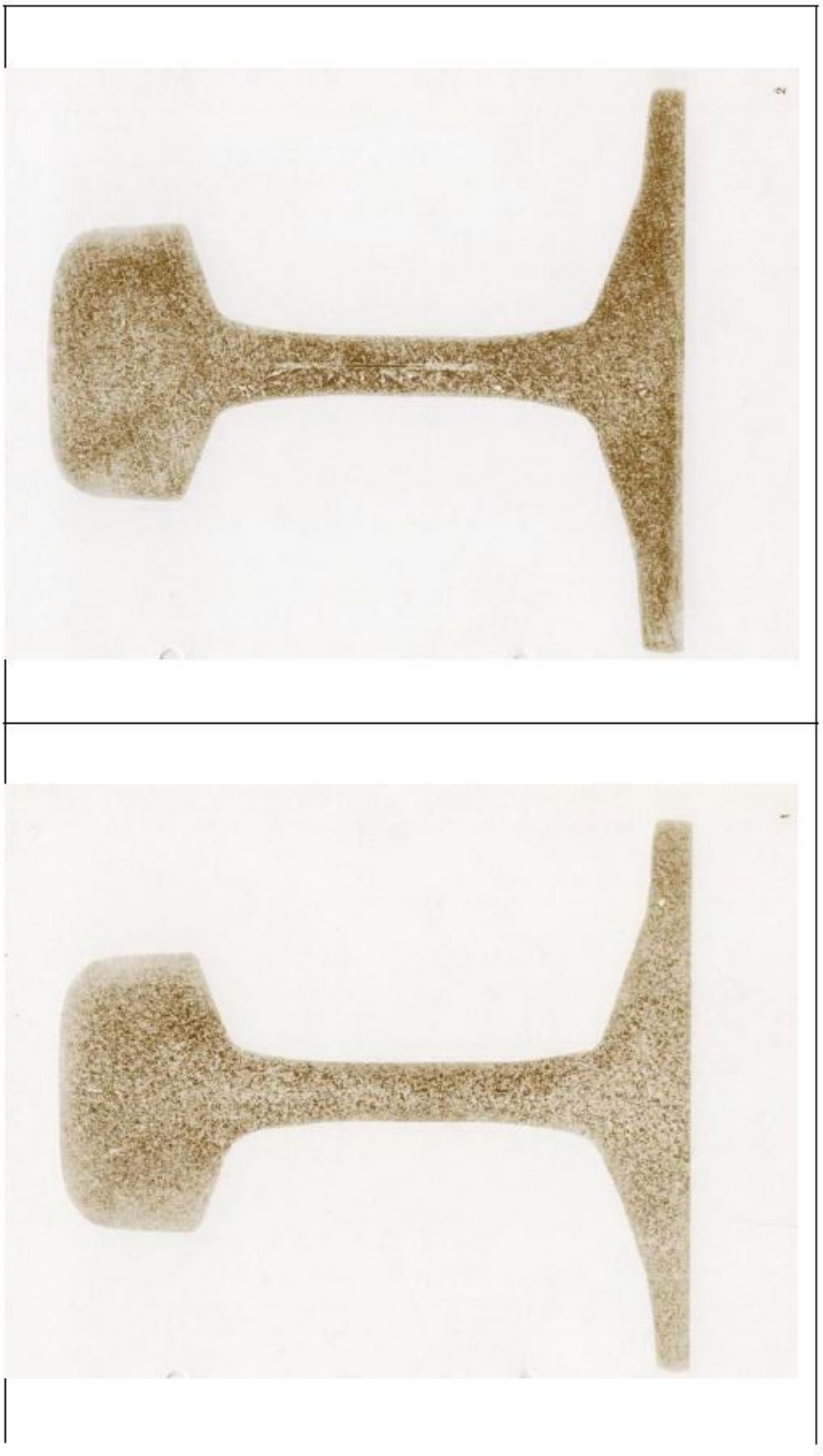
Date	HEAT NO	PERCENTAGE											H_2 PPM	O_2 PPM
		C	Mn	Si	S	P	Mo	Cr	V	Ni	Cu	Al		

IRS-T-I2-2009

APPENDIX- VIII

ALBUM
OF
MACROGRAPHIC PRINTS

IRS-T-12-20(



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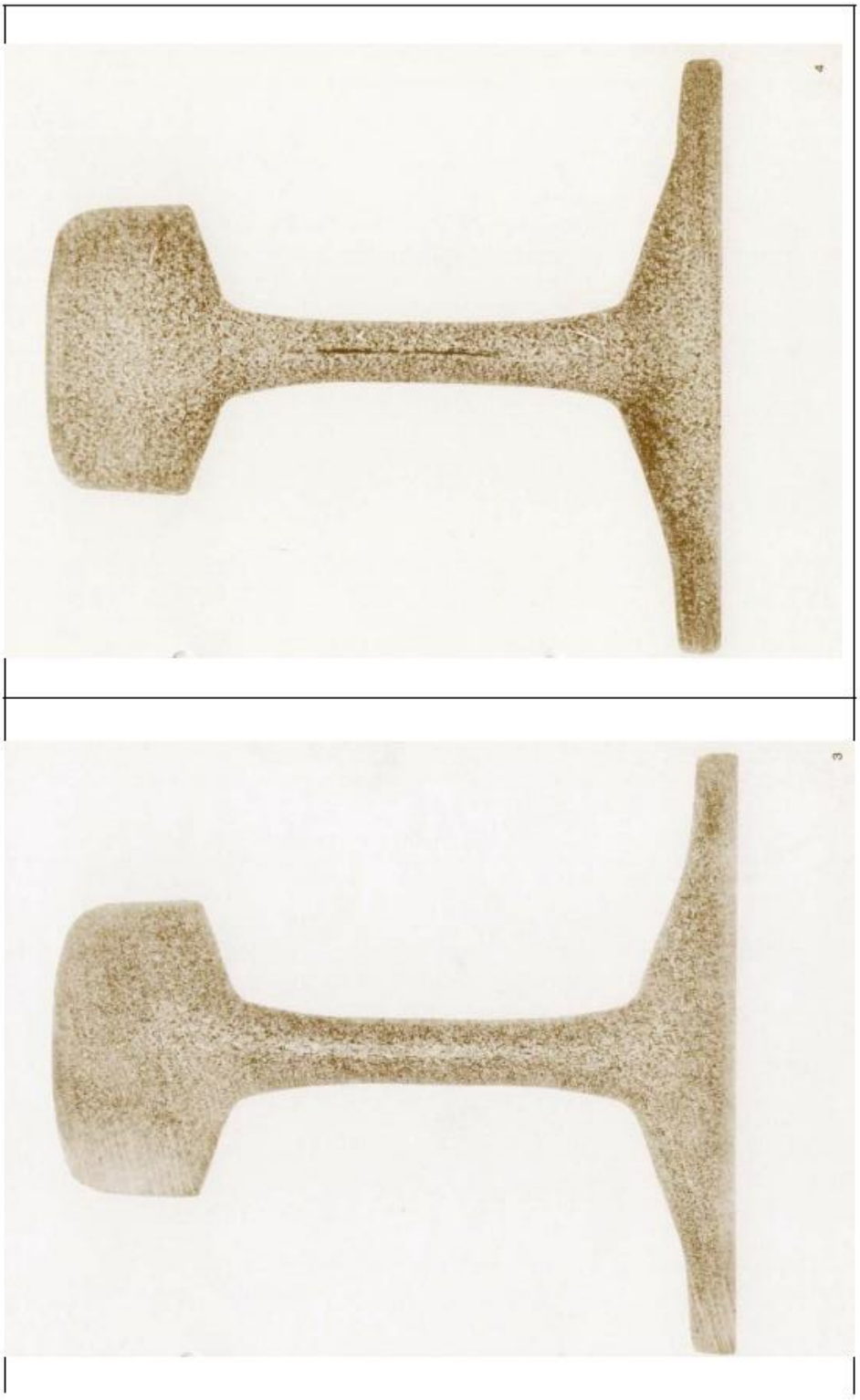
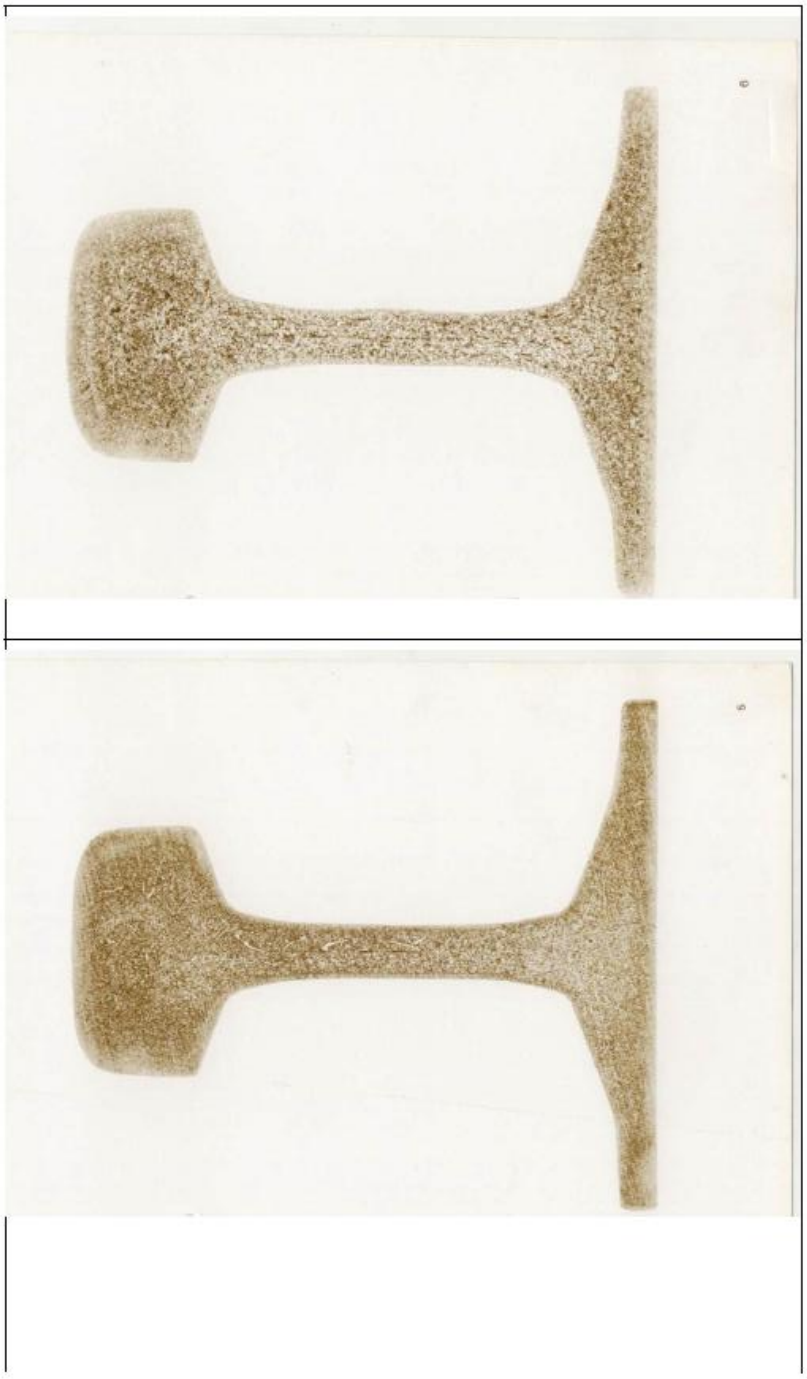


IRS-T-12-20



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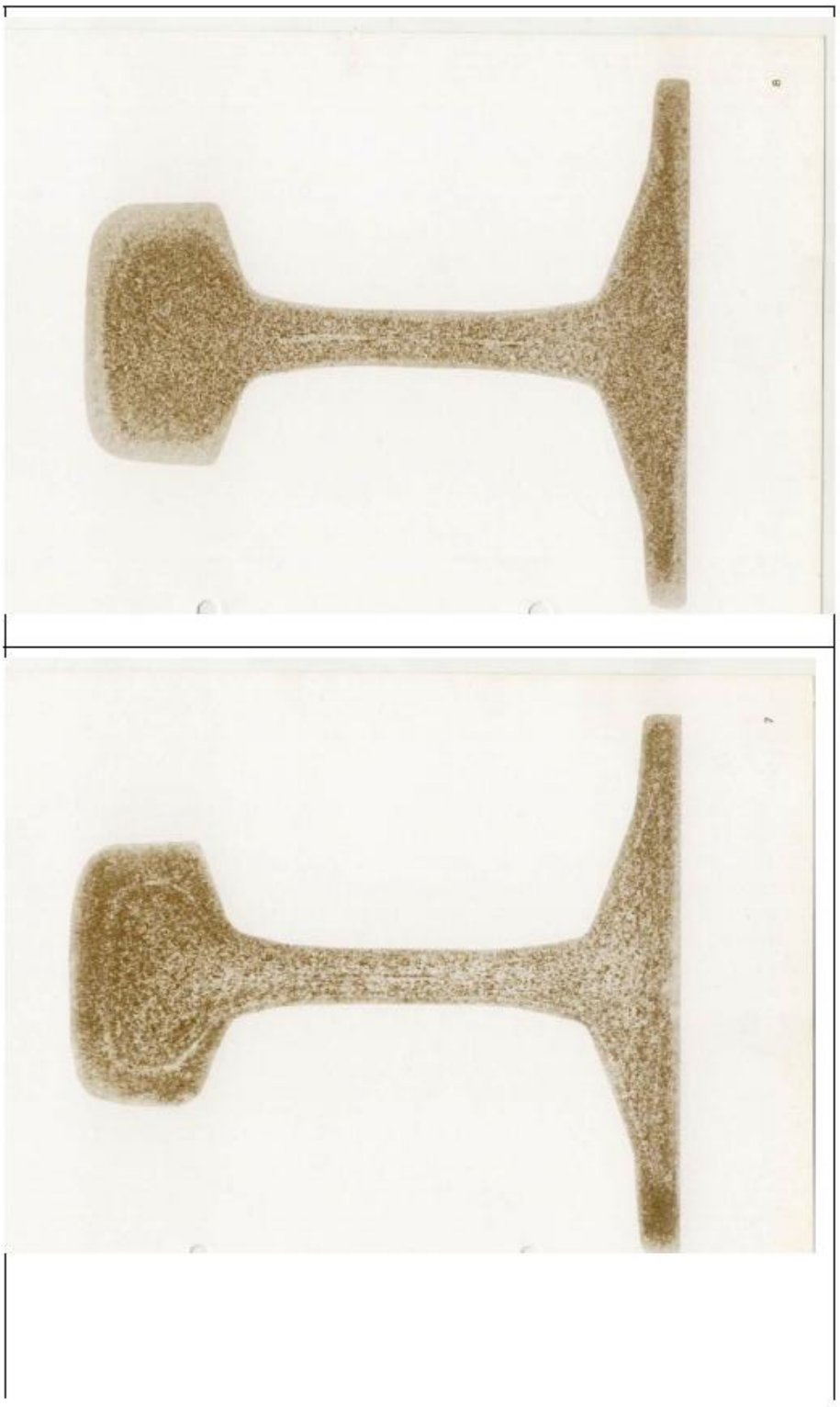
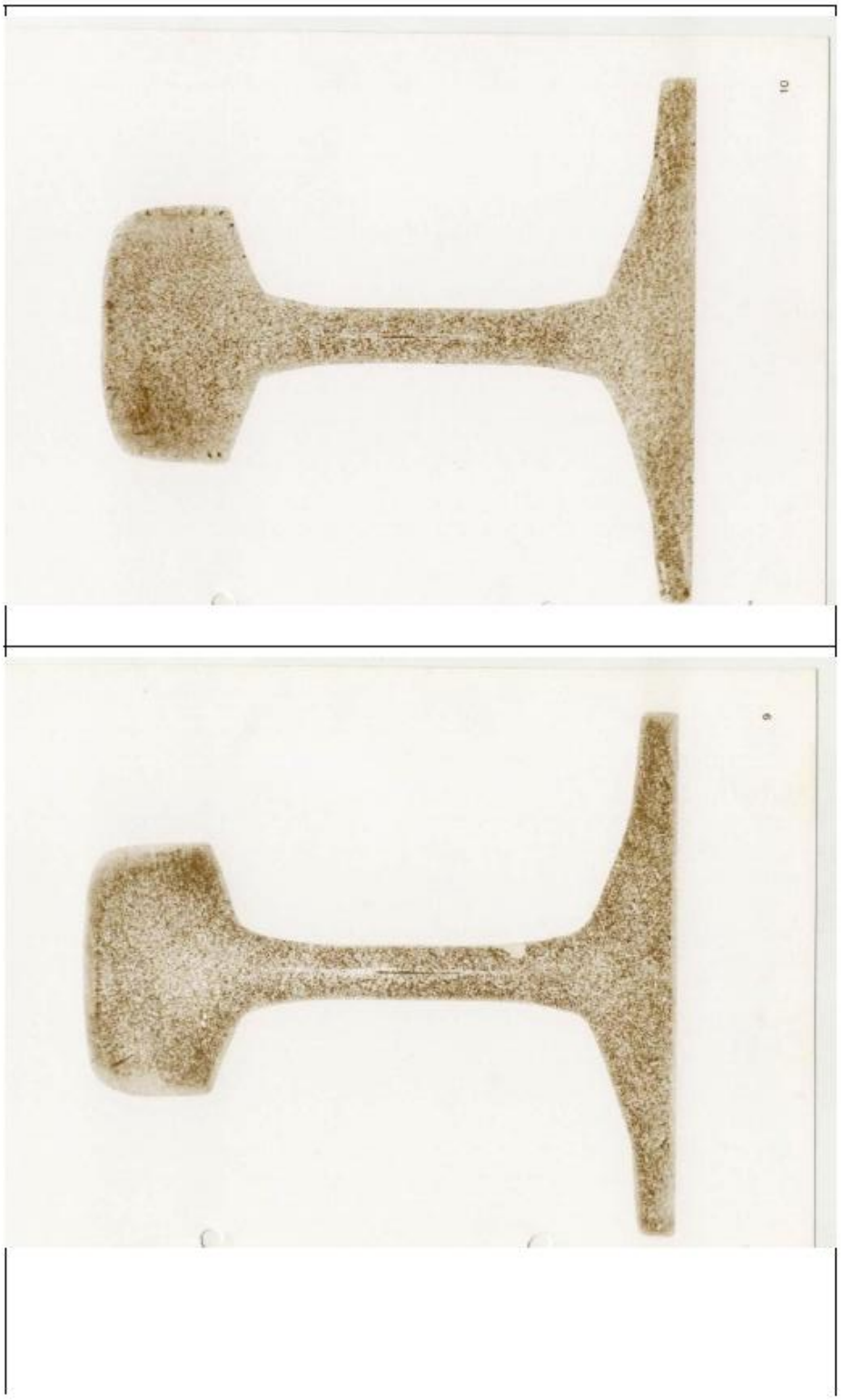


IRS-T-12-



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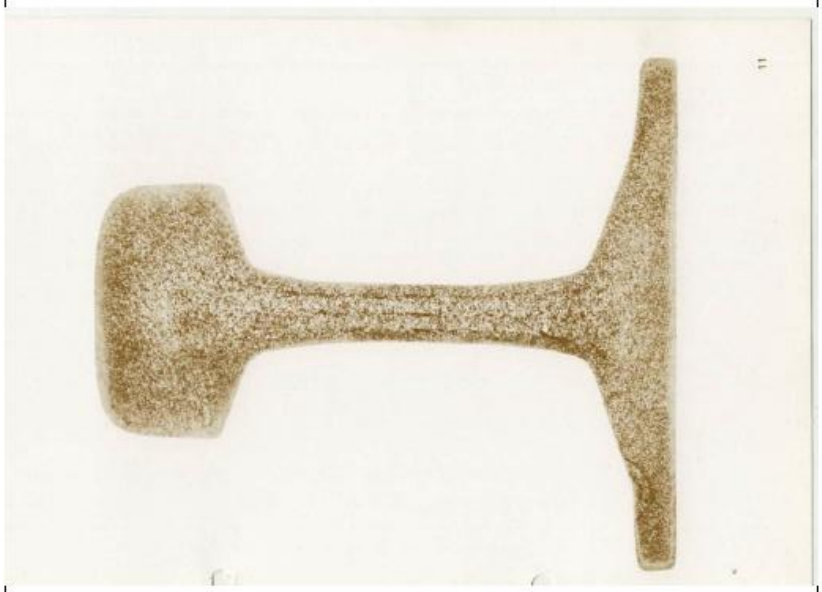

IRS-T-12-2009

APPENDIX- IX

MECHANICAL PROPERTIES

DATE	HEAT NO	SPECIMEN		BEFORE FRACTURE	AFTER FRACTURE	% ELONGATION	BREAKING LOAD kg	YS MPa	UTS MPa	HARDNESS (BHN)	FALLING WEIGHT TEST	
		DIA mm	AREA mm^2	INITIAL GAUGE LENGTH mm	FINAL GAUGE LENGTH mm						BROKEN/ NOT BROKEN	DEFLECTION mm
1	2	3	4	5	6	7	8	9	10	11	12	13

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APPENDIX- X

DETAILS OF RAILS OFFERED FOR INSPECTION

Date	Heat no	No of blooms produced from the heat	Wt. Of blooms produced from the heat	No of rails of length		No of rails found o.k. after internal inspection		No of rails rejected during internal inspection	
1	2	3	4	5		6		7	
				260 M		260 M		260 M	
				259 M		259 M		259 M	
				130 M		130 M		130 M	
				129 M		129 M		129 M	
				26 M		26 M		26 M	
				25 M		25 M		25 M	
				24 M		24 M		24 M	
				13 M		13 M		13 M	
				12 M		12 M		12 M	
				11& 10 M		11& 10 M		11 &10M	

APPENDIX -XI

Standard test method for the determination of the plane strain fracture toughness (K_{1c}) of rails

B.1 Test methods

This test shall be performed in accordance with the requirements of ASTM E399 except where superseded by the requirements specified in this part of IRS T 12. The requirements specified in this part of the IRS T 12 apply only to the determination of plane strain fracture toughness of railway rail steels covered by the definitions and requirements of this standard.

B.2 Test pieces

B.2.1 The location of the test piece in the rail's transverse section is shown in Figure B.1.

B.2.2. The thickness "B" of all test pieces shall be 25 mm. For any rail head transverse profile the test piece width "W" shall be the maximum achievable of the following dimensions:

40 mm;
45 mm;
50 mm.

B.3 Number of tests

A minimum of 5 tests from each sample shall be performed.

B.4 Test conditions

B.4.1 Fatigue pre-cracking shall be carried out in the temperature range + 15° C to + 25° C using a stress ratio in the range > 0 <+0.1. Fatigue pre-cracking shall be carried out at a cyclic frequency in the range 15 Hz to 120 Hz. The final crack length to test piece width ratio shall be in the range 0.45 to 0.55.

B.4.2 The single edge notched bend test piece shall be loaded under displacement control using three point bending with a loading span (S) equal to four times the test piece width (W)

B.4.3 Tests shall be performed at a test temperature of -20° C $\pm$ 2° C. Test piece temperature shall be measured using a beadless thermocouple spot welded to the test piece at the location shown in figure B.2.

1) It is recommended that the chevron notch in ASTM E399 is used to avoid crack front curvature problems.

B.5 Analysis of test data

B.5.1The calculation of K_Q shall be in accordance with ASTM E399. The checks made to establish whether this value is a valid K_{1c} shall be in accordance with ASTM E399 except for the requirements of B.5.2 to B.5.6.

B.5.2 P_{max} / P_Q shall be less than 1.10 for force-crack mouth opening curves where pop-in does not occur before the intersection of the curve with the 95 % secant. There shall be no P_{max} / P_Q .criterion for other types of curve.

B.5.3 The linearity of force-crack mouth opening curves la. lb. lla and lll (see figure B.3) shall be checked in the following manner.

Measure the distance (υ_l) between the tangent OA and the force-crack mouth opening curve at a constant force of 0.8 P_Q Measure the distance (υ) between the tangent OA and the force-crack mouth opening curve at a constant force of P_Q .for a test result to be valid… $\upsilon_l \leq 0.25\upsilon$

B.5.4 The linearity of force – crack mouth opening curves llb and llc (see Figure B.3) shall be checked in the following manner.

Measure the distance between the tangent OA and the force-crack mouth opening curve at constant forces of 0.8 P_Q.and P_Q.recording these values as υ_l *and υ*..respectively.

Measure the crack mouth opening values arising from all "pop-ins" that occur up to P_Q.this is done by measuring the horizontal distance travelled along the crack mouth opening axis between the start and finish of each "pop-in". Sum the values for "pon-ins" occurring below 0.8 P_Q.and for those occurring between 0.8 P_Q.and P_Q.recording them as $\sum\upsilon_{lpl}$ and $\sum \upsilon_{pl}$.respectively.

For a test result to be valid …[. $\upsilon_l - \sum\upsilon_{lpl}$] $\leq 0.25[\upsilon - (\sum\upsilon_{pl} + \sum\upsilon_{lpl})]$

B.5.5 The linearity criterion cannot be applied to force-crack mouth opening curve IV.

B.5.6 For all force-crack mouth opening curves the K_Q value shall be subjected to the validity check that the test piece thickness (B) and crack length (a) are equal to, or greater than, the value of $2.5(K_Q / R_{p0.2})^2$, where $R_{p0.2}$ ..is the 0.2% proof stress at the fracture test temperature of – 20°C.

B.6 Reporting of results

All measurements required to calculate the test result and to show that the test conditions were as specified in the test procedure shall be recorded.

All results shall be reported as either K_{1c} values K_{Q*}.values or K_Q.values; where K_{Q*}.values are those K_Q values which failed the validity criteria due only to one or more of the following:

i) $P_{MAX} / P_Q > 1.1$;
ii) Exceedence of the $2.5(K_Q / R_{p0.2})^2$ criterion;
iii) Crack mouth opening displacement-force relationship.

The mean and standard deviation of both $K_{1c}$and K_{Q^*}results shall be recorded. For each grade of rail tested these results shall be included in a table giving the following information.

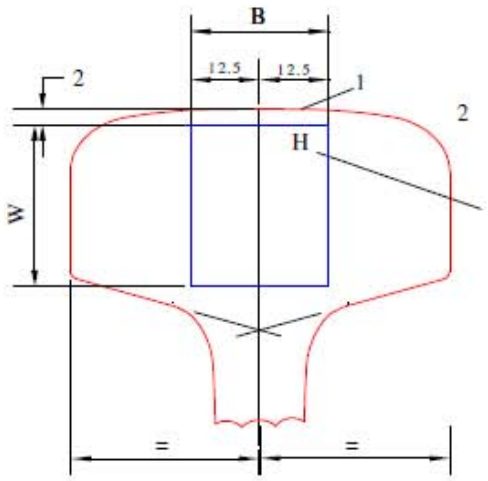
Steel Grade	0.2% proof stress at −20°CMPa	Mean K_{1c} (MPa $m^{1/2}$)	Number of K_{1c} results	Samples standard deviation (MPa $m^{1/2}$)	Mean (K_Q) (MPa $m^{1/2}$)	Number of K_Q.. Results	Sample standard deviation (MPa $m^{1/2}$)

The value to be used for the acceptance criteria is that of the mean K_{1c} and shall be based on a minimum of five K_{1c} values.

When five K_{1c} values have not been obtained any K_Q *.values shall be included with any K_{1c} values in the mean value to be used for the acceptance criteria. In this event the number of test results shall be at least ten.

All values of K_{1c} And K_{Q^*} shall be above the minimum value specified in Table 2.

Dimension in millimetre



Figure

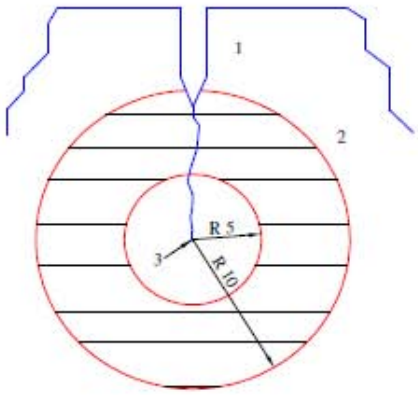
Key

1. Notch machined in this face
2. Section through rail heat
3. Letter 'H' to be stamped on end face of test piece as shown

B = 25
W = see B.2.2
For all other test piece proportions See ASTM E399

Figure B.1-Location and section of fracture toughness test pieces

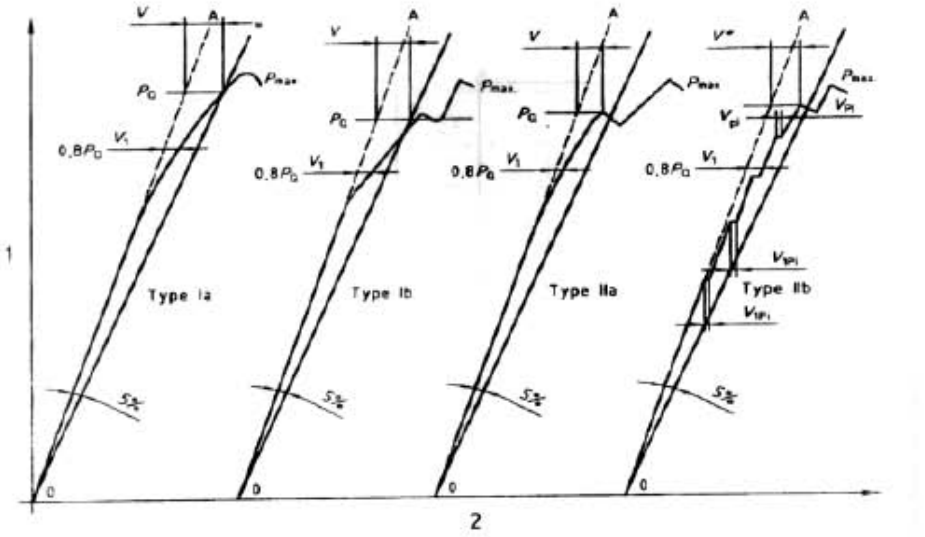
Dimension in millimetres



Key

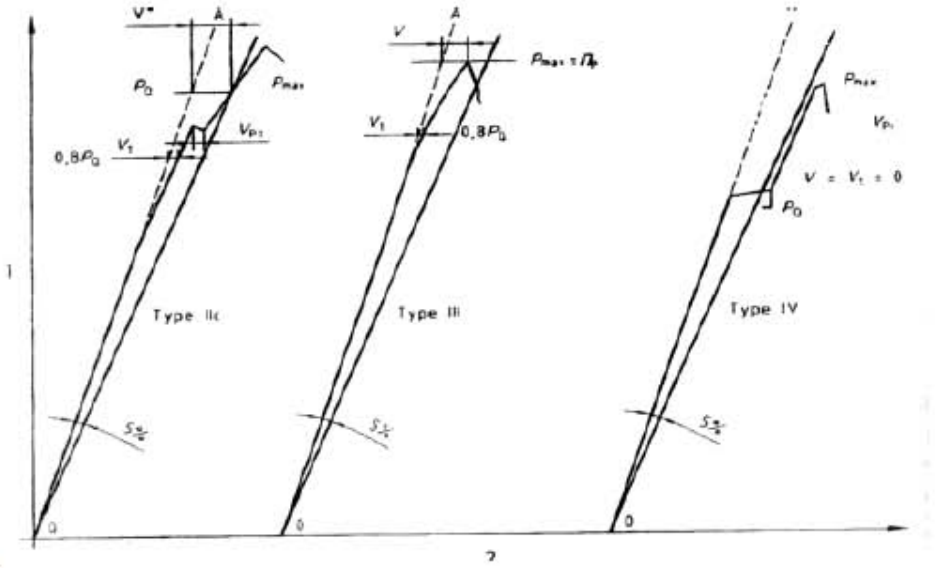
1. Notch
2. Thermocouple to be placed in the shaded zone
3. Fatigue crack tip

Figure B.2-Location of thermocouple on fracture toughness specimens



Key

1. Force, P
2. Crack mouth opening displacement (v)



Key

1. Force, P
2. Crack mouth opening displacement (v)

Figure B.3 – Force-Crack mouth opening curves

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No. CT/Specification/T-12 Dated: 29.09.2011.

As per list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषय: समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: (i) Railway Board's letter no. Track/21/2010/0513/7 dated 14.09.2011.
(ii) This office letter of even no. dated 22.07.2011.

संदर्भ: (i) रेलवे बोर्ड के पत्र संख्या ट्रेक/21/2010/0513/7 दिनांक 14/9/2011।
(ii) इस कार्यालय के सम संख्या पत्र दिनांक 22/07/2011।

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 1 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: 05 Pages

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ –1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 1
TO
INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAILS
IRS T-12:2009

I. In Table No. 1 of chemical composition and mechanical properties corresponding to Clause 7 for corrosion resistant rail is replaced as per table enclosed herewith as Annexure-A.

II. Following note below table of Para 9.1.2 is deleted.
"All other requirements as regards variation in dimensions, length and falling weight tests shall be as per prime quality rail 9.1.1"

III. Appendix V (wrongly written) at Page no. 34 is replaced with Appendix VI and VI-A for test rail for USFD testing of rails referred in Clause10.3. Details of test rail for symmetrical rail section is shown in Appendix VI and details of test rail for asymmetrical rail section is shown in Appendix VI-A.

IV. Clause 23.6 at is to be replaced as under: -

"23.6 Passed rails should be properly stacked on leveled and well drained stacking area. Rails shall be stacked in head up position with 100 x 25 mm mild steel flats as spacers at a distance of 4.0 m between successive layers. Recommended arrangement for stacking of rails shall be as per RDSO drawing no. RDSO/T-6219, as Appendix XII."

TABLE 1 – Contd...

CORROSION RESISTANT RAIL STEEL

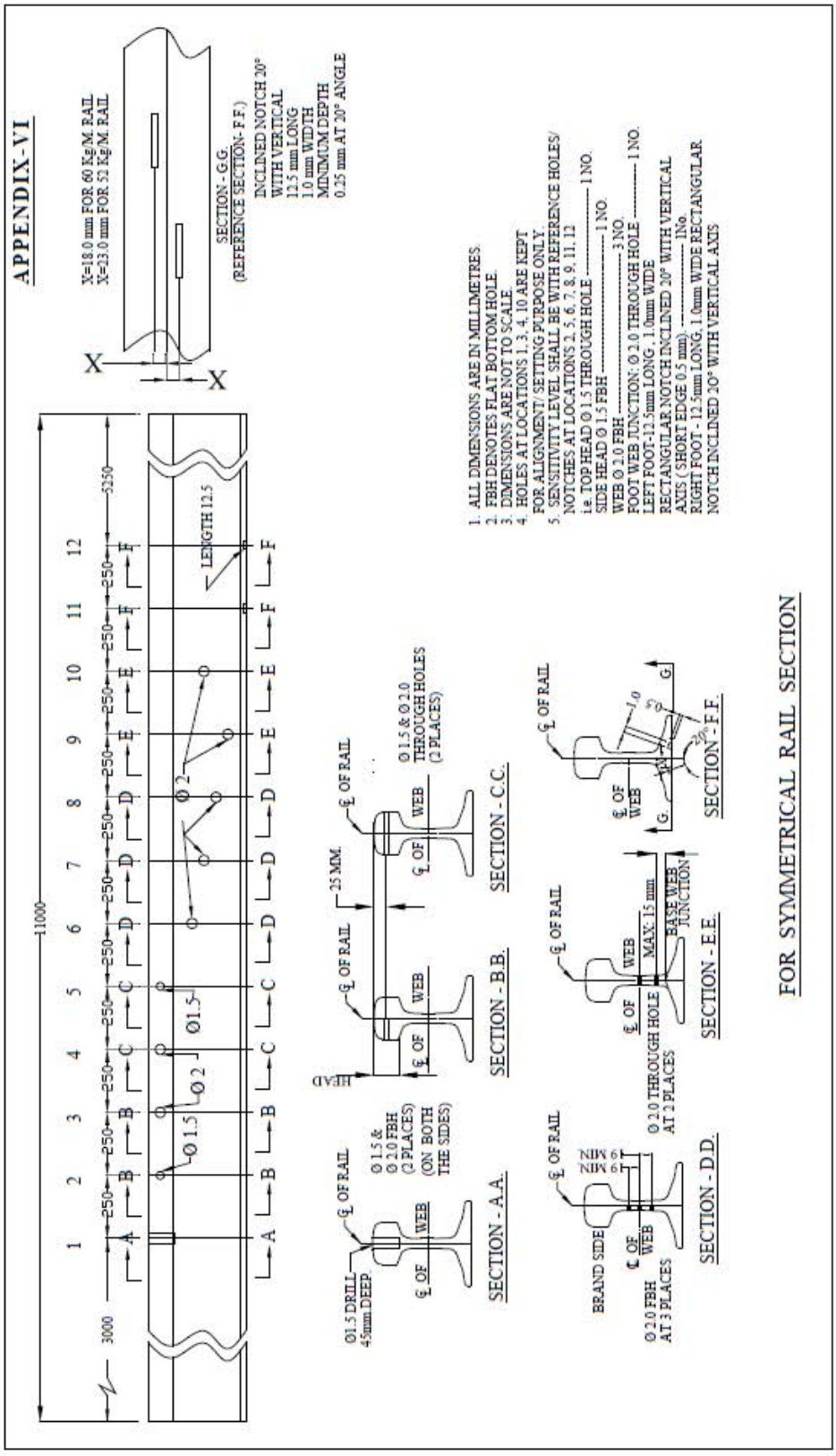
Grade	Chemical Composition (percentage)											Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	Cu	Ni	10^{-4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (MPa)(Min.)	Elongation % on gauge length – $5.65\sqrt{So}$ (min)	Running surface min hardness (BHN)
Copper-Molybdenum (CM)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.2-0.3	-	0.25-0.35	-	-	1.6 ppm	880	460	10.0	260
Nickel Chromium Copper (NC)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.25	0.50-0.65	0.3-0.4	0.25-0.40	-	1.6 ppm	880	550	10.0	260

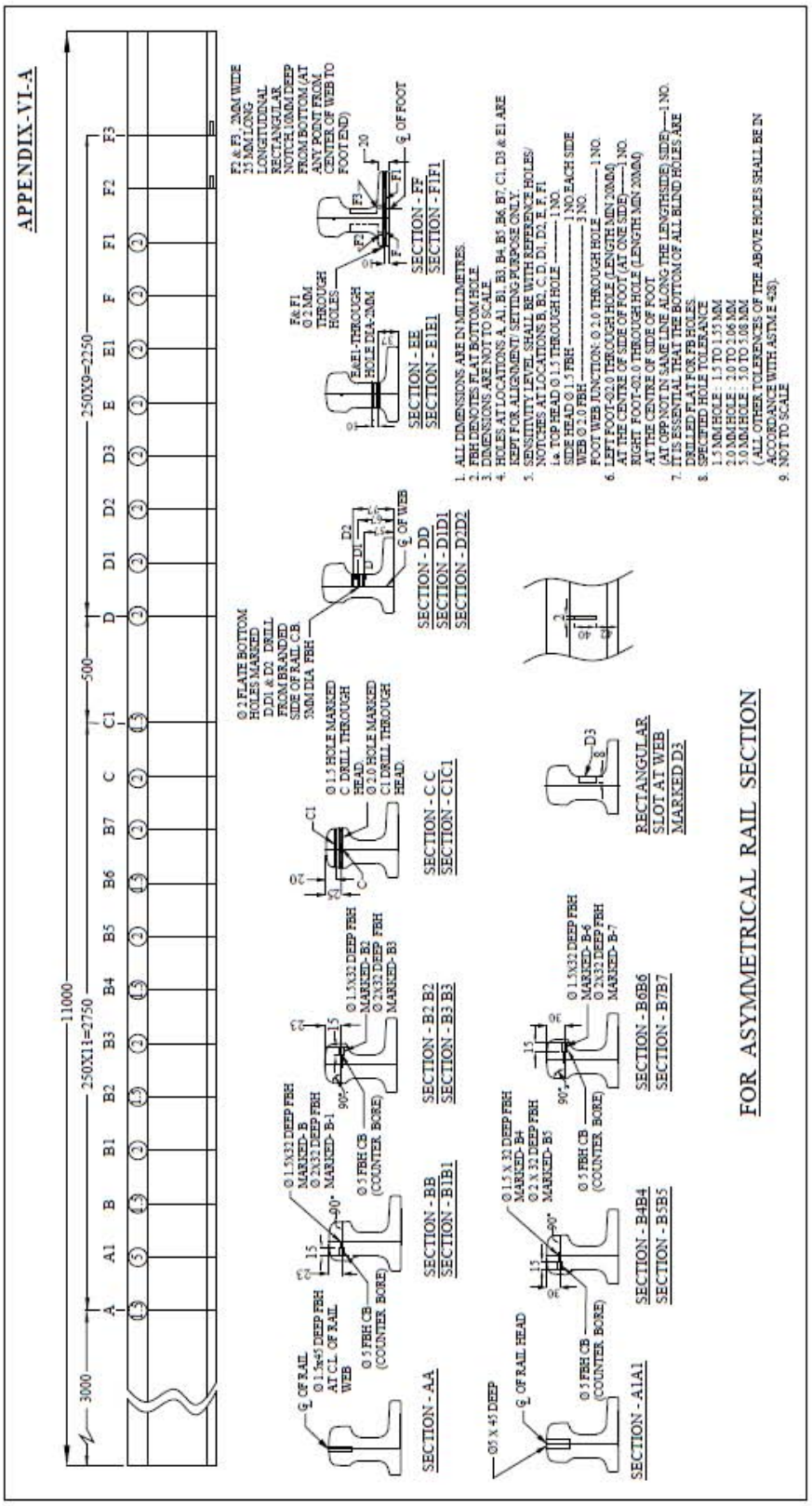
So = Cross sectional area of tensile test piece in mm^2

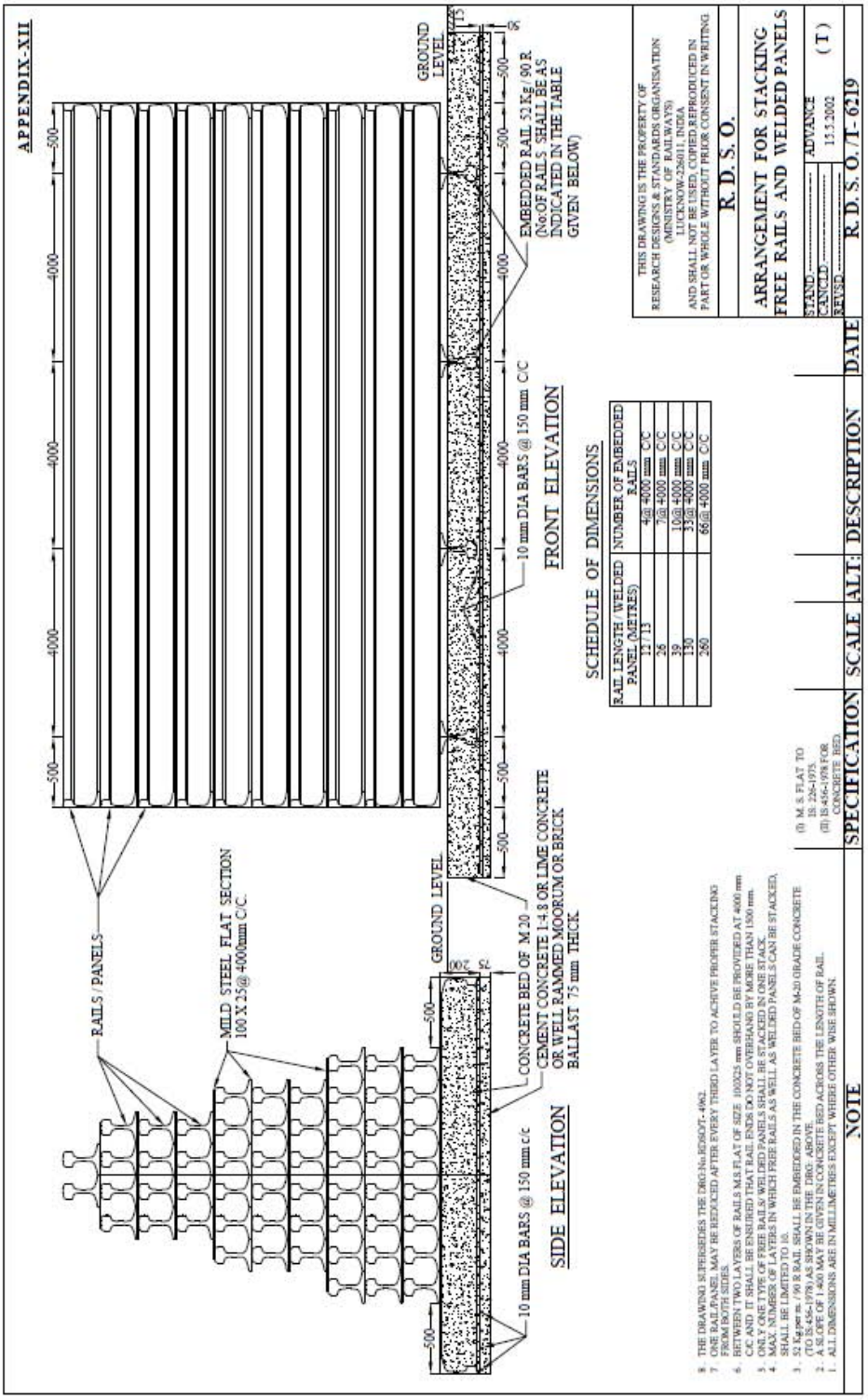
* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.


APPENDIX-VI
X=18.0 mm FOR 60 Kg/M. RAIL
X=23.0 mm FOR 52 Kg/M. RAIL
SECTION - G.G.
(REFERENCE SECTION- F.F.)
INCLINED NOTCH 20°
WITH VERTICAL
12.5 mm LONG
1.0 mm WIDTH
MINIMUM DEPTH
0.25 mm AT 20° ANGLE
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FBH DENOTES FLAT BOTTOM HOLE
3. DIMENSIONS ARE NOT TO SCALE.
4. HOLES AT LOCATIONS 1, 3, 4, 10 ARE KEPT FOR ALIGNMENT/ SETTING PURPOSE ONLY.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE HOLES/ NOTCHES AT LOCATIONS 2, 5, 6, 7, 8, 9, 11, 12
i.e. TOP HEAD Ø 1.5 THROUGH HOLE ---------- 1 NO.
SIDE HEAD Ø 1.5 FBH ---------- 1 NO.
WEB Ø 2.0 FBH ---------- 3 NO.
FOOT WEB JUNCTION: Ø 2.0 THROUGH HOLE ---------- 1 NO.
LEFT FOOT-12.5mm LONG , 1.0mm WIDE
RECTANGULAR NOTCH INCLINED 20° WITH VERTICAL AXIS (SHORT EDGE 0.5 mm) ---------- 1No.
RIGHT FOOT - 12.5mm LONG, 1.0mm WIDE RECTANGULAR NOTCH INCLINED 20° WITH VERTICAL AXIS
FOR SYMMETRICAL RAIL SECTION
11000
3000
3250
LENGTH 12.5
Ø 1.5
Ø 2
SECTION - A.A.
SECTION - B.B.
SECTION - C.C.
SECTION - D.D.
SECTION - E.E.
SECTION - F.F.
Ø 1.5 & Ø 2.0 THROUGH HOLES (2 PLACES)
Ø 1.5 & Ø 2.0 FBH (2 PLACES) (ON BOTH THE SIDES)
Ø 1.5 DRILL 45mm DEEP
Ø 2.0 FBH AT 3 PLACES
Ø 2.0 THROUGH HOLE AT 3 PLACES
25 MM.
MAX. 15 mm
BASE WEB JUNCTION
BRAND SIDE
HEAD
WEB
℄ OF RAIL
℄ OF WEB


APPENDIX-VI-A
FOR ASYMMETRICAL RAIL SECTION
SECTION - AA
SECTION - A1A1
SECTION - BB
SECTION - B1B1
SECTION - B2 B2
SECTION - B3 B3
SECTION - B4B4
SECTION - B5B5
SECTION - B6B6
SECTION - B7B7
SECTION - CC
SECTION - C1C1
SECTION - DD
SECTION - D1D1
SECTION - D2D2
SECTION - EE
SECTION - E1E1
SECTION - FF
SECTION - F1F1
RECTANGULAR SLOT AT WEB MARKED D3
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FBH DENOTES FLAT BOTTOM HOLE
3. DIMENSIONS ARE NOT TO SCALE
4. HOLES AT LOCATIONS A, A1, B1, B3, B4, B5, B6, B7, C1, D3 & E1 ARE KEPT FOR ALIGNMENT SETTING PURPOSE ONLY.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE HOLES/ NOTCHES AT LOCATIONS B, B2, C, D, D1, D2, E, F, F1
i.e. TOP HEAD Ø 1.5 THROUGH HOLE ——— 1 NO.
SIDE HEAD Ø 1.5 FBH ——— 1 NO.EACH SIDE
WEB Ø 2.0 FBH ——— 3 NO.
FOOT WEB JUNCTION Ø 2.0 THROUGH HOLE ——— 1 NO.
6. LEFT FOOT-Ø2.0 THROUGH HOLE (LENGTH MIN 100MM) ——— 1 NO.
AT THE CENTRE OF SIDE OF FOOT (AT ONE SIDE)
RIGHT FOOT-Ø2.0 THROUGH HOLE (LENGTH MIN 100MM)
AT THE CENTRE OF SIDE OF FOOT
(AT OPP NOT IN SAME LINE ALONG THE LENGTH SIDE) ——— 1 NO.
7. IT IS ESSENTIAL THAT THE BOTTOM OF ALL BLIND HOLES ARE DRILLED FLAT FOR FB HOLES
8. SPECIFIED HOLE TOLERANCE
1.5 MM HOLE : 1.5 TO 1.55 MM
2.0 MM HOLE : 2.0 TO 2.06 MM
3.0 MM HOLE : 3.0 TO 3.08 MM
(ALL OTHER TOLERANCES OF THE ABOVE HOLES SHALL BE IN ACCORDANCE WITH ASTM E 488).
9. NOT TO SCALE


APPENDIX-XII
RAILS / PANELS
MILD STEEL FLAT SECTION
100 X 25@ 4000mm C/C
GROUND LEVEL
CONCRETE BED OF M 20
CEMENT CONCRETE 1:4:8 OR LIME CONCRETE
OR WELL RAMMED MOORUM OR BRICK
BALLAST 75 mm THICK
10 mm DIA BARS @ 150 mm c/c
SIDE ELEVATION
10 mm DIA BARS @ 150 mm C/C
EMBEDDED RAIL 52 Kg / 90 R
(No.OF RAILS SHALL BE AS
INDICATED IN THE TABLE
GIVEN BELOW)
FRONT ELEVATION
SCHEDULE OF DIMENSIONS
RAIL LENGTH / WELDED PANEL (METRES) | NUMBER OF EMBEDDED RAILS
13 / 13 | 4@ 4000 mm C/C
26 | 7@ 4000 mm C/C
39 | 10@ 4000 mm C/C
130 | 33@ 4000 mm C/C
260 | 66@ 4000 mm C/C
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R. D. S. O.
ARRANGEMENT FOR STACKING FREE RAILS AND WELDED PANELS
STAND
CANCLD
REVSD
ADVANCE
13.5.2002
(T)
R. D. S. O. / T - 6219
NOTE
SPECIFICATION
SCALE
ALT:
DESCRIPTION
DATE

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No. CT/Specification/T-12 Dated: 03.02.2012.

As per list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषय: समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: Railway Board's letter no. Track/21/2010/0513/7 dated 01.02.2012.

संदर्भ: रेलवे बोर्ड के पत्र संख्या ट्रैक/21/2010/0513/7 दिनांक 01/02/20112

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 2 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: 01 Page

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ –1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 2

TO

INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAIL

IRS T-12:2009

26.0 WARRANTY

As a warranty for supply of rails free from manufacturing defects by rail suppliers, after initial USFD testing of new rails in rail manufacturing plants, a USFD test free period of 25% of service life of rails in terms of GMT as given below (Para 302 (i) (d) of IRPWM-2004 as amended from time to time) shall be applicable. This clause of test free period of 25% of service life of rails shall also be applicable for all types of 90 UTS (grade 880) and higher grade of rails of this specification.

Rail Section	Assessed GMT service life for 90 UTS rails
60 Kg	800
52 Kg	525
90 R	375

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No. CT/Specification/T-12 Dated: 27.06.2012.

As per mailing list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषयः समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: Railway Board's letter no. Track/21/2008/0801/7 dated 22.06.2012.

संदर्भः रेलवे बोर्ड के पत्र संख्या ट्रैक/21/2008/0801/7 दिनांक 22/06/2012

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 3 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: As above

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ–1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 3

TO

INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAIL

IRS T-12:2009 DATED 27.6.2012

The Rails in regard to their quality, manufacturing process, chemical composition, testing/ retesting, qualifying criteria, etc., shall be complying Indian Railway Specification IRS-T-12-2009 for Flat Bottom Rail with following amended clauses.

1. **Clause 5.4: Head Hardening Process**

   For head hardening, rails shall be suitably heat treated to meet the requirements of the specification. The method of heat treatment adopted by the manufacturer should be made available to the purchaser. In-line established deep Head Hardening methods using air quenching process would be acceptable with the prior approval of the Purchaser. Any other process of Head Hardening would also be acceptable with the prior approval of the Purchaser.

2. **Clause 7: Grade, Chemical Composition and Mechanical Properties**

   The steel for the rails shall be of fully killed quality and shall confirm to chemical composition and mechanical properties given in Table -1. Micro alloying elements of Cr(0.3% max.) & V (0.01% max.) may also be acceptable, as it helps in improving mechanical properties. The limits for chemical composition are applicable both for tests on ladle samples and for check analysis of finished rails. Ladle and check analysis of steel, will be carried out by the method specified in the relevant part of IS: 228 or by any other established instrumental/chemical method of testing with the approval of the purchaser. In case of any dispute, the procedure given in the relevant part of IS:228 shall be referred.

3. **Clause 8.1: Brand Marks**

   With the prior approval of purchasers, brand marks of suitable size clearly legible, shall be rolled in relief on one side of web at 3.0 to 4.0 meters interval.

   The brand mark shall include:

   a) The rail section.
   b) The grade of steel, i.e.
      Grade 880 - 880



Grade 1080 HH	-	1080 HH
Grade 1080 Cr	-	1080 CR
Grade 880 Cu-MO	-	880 CM
Grade 880 Ni Cr Cu	-	880 NC
Grade 880 Vanadium	-	880 VN
Grade 880 Niobium	-	880 NB

c) Identification mark of the manufacturer

d) Month (using roman numbers) and last two digits of year of manufacture.

e) Process of steel making: -

i) Basic oxygen - O

ii) Electric - E

4. Clause 8.2: Hot Stamping

Each rail shall be identified by a numerical, alphabetical or combined alphabetical and numerical code which will be distinctly hot stamped at least once every 5.0m on the web in figures and letters of suitable size from which following information can be obtained:

i) The number of the cast from which the rails has been rolled with letter 'C'

ii) Number of the strand.

iii) For rails from change over bloom, cast number should be the preceding cast number with prefix letter 'B'.

5. Clause 8.3: Cold Punching

8.3.1 Following should be cold punched on one of end face of each rail

a) Inspecting Agency ID and Group ID
b) Shift No in which product inspected
c) Date of Inspection

To avoid damage to the HH rails, instead of cold punching, any other method of marking can be adopted, with the prior approval of the Purchaser.



6. Clause 8.4:Colour code

Rails shall be painted as per colour code given in Appendix-IV to distinguish grade, class, length and other special requirements. Paint of good quality should be used with the prior approval of the Inspecting Agency. Alternatively , different colour code may also be decided by the supplier with the prior approval of purchaser.

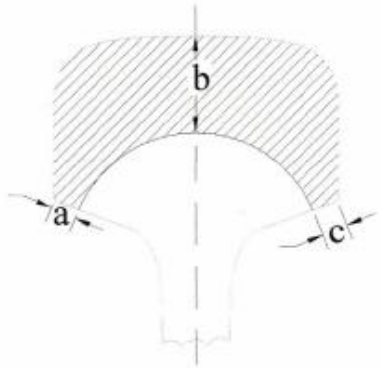
7. Clause 9.2: Length of Rails

The standard length of rail shall be 13 meters or 25 meters or 26 meters. The manufacturer shall be entitled to supply in pairs of short lengths up to 10% by weight of the quantity contracted for or ordered. Shorter lengths shall not be less than 10.0m in length for 13.0M and shall not be less than 23M in lengths for 25M and 24 M in lengths of rail for 26M. Short lengths shall be in multiples of 1.0M. In case of ZU 1-60, 1080 HH grade Rails, length shall be suitable for turnout design offered/proposed.

Type of Rail	Tolerance in length	
Prime Quality Rail	+20 mm	-10 mm
IU Grade	+30 mm	-30 mm

8. **Clause 18.3: Macro-Structure Test (For 1080 HH Grade Rails)**

One macro-structure test of hardened layer per 1000 meters of heat treated rails shall be performed. Macro structure of heat affected zone shall confirm to figure 7.



a,c	≥	10 mm
b	≥	15 mm

Figure -7

Due to specific process of heat treatment being adopted by the manufacturer e.g. inline air quenching method, Macro-structure of heat affected zone may not

show distinct zones, as shown above in figure-7, supplier should advise about the same to the purchaser in advance.

9. Clause 19.2.3: Hardness Distribution Test

The hardness distribution test shall be conducted on transversely cut rail section as shown in figure-8 . Hardness value at any point shall not exceed 390BHN. The cross sectional hardness distribution of heat treated rails shall slope towards the inside. No sharp drop in hardness should be present. The hardness at 10mm below, the rail head shall be 340BHN minimum. The hardness at 15 mm below the rail head table at centre shall be minimum 315BHN.

10. Clause 21: Determination of Hydrogen Content

Vacuum degassing of liquid steel shall be done to reduce the hydrogen content. For this purpose, RH degasser or REDA (Revolutional Degassing Activator) shall be used. In case, any other method of vacuum degassing is adopted, then the same will require prior approval of the Purchaser. The vacuum levels and the duration for which liquid steel shall be kept under this level shall be decided mutually by the purchaser and manufacturer. All measurement of hydrogen shall be done for the liquid steel in tundish or mould. Any other method of sampling or determination of hydrogen will require prior approval of the purchaser.

Clause 21.1 The measurement of hydrogen shall be done by following method:

Clause 21.1 (a) On-Line/Instantaneous Method-

HYDRIS is approved as method of on-line instantaneous measurement. The method of measurement as prescribed by the manufacturer of HYDRIS system shall be adopted with approval of the purchaser. Any other alternate method of determination of hydrogen will require prior approval of the purchaser.

(b) Pin Sample Method-

In case, the manufacturer has not installed the facility for on-line/instantaneous facility for measurement of hydrogen as described in Para (a) above, this method may be adopted with prior approval of the purchaser.

In this method, sample of liquid steel shall be taken by plunging the sampler 200mm - 300 mm below the molten metal surface in mould and molten slag-metal interface in tundish. The sample should be held for 2 to 3 seconds and then quenched in cold water so that sample temperature falls to below 150^0C within 5 seconds.

The sample should be removed from cold water and packed in dry ice if analysis is carried out within 48 hours of sampling or placed in liquid nitrogen if analysis is to be carried out beyond 48 hours after sampling. Sampling should be done by 6 mm dia vacuum tube of Pyrex glass with wall of thickness of 1.0mm and approximately 0.5 mm thick in the fill-end. The tube should have desired vacuum of 10^{-3} mm of Hg.

The hydrogen sample can be analysed by inert gas fusion technique in which sample is to be fused at approximately 1900^0 C in an induction heating graphite crucible. A nitrogen carrier gas transports the released hydrogen to thermal conductivity cell. The amplified and integrated output of the cell is to be calibrated for hydrogen in ppm.

LECO – RH –2 Hydrogen Analyser may be used for Hydrogen determination.

Any other size and material of tube and method of hydrogen determination will require prior approval of the purchaser.

21.2 The level of hydrogen measured by the method described under Para 21.1 above shall be 1.6 ppm maximum for acceptance of a heat for production of rail.

11. Clause 26: WARRANTY

As a warranty for supply of rails free from manufacturing defects by rail suppliers, after initial USFD testing of new rails in rail manufacturing plants , a USFD test free period of 25% of service life of rails in terms of GMT as given below (Para 302 (1) (d) of IRPWM-2004 as amended from time to time) shall be applicable. This clause of test free period of 25%of service life of rails shall also be applicable for all types of 90 UTS (grade 880) and higher grade of rails of this specification. If any rail fracture due to suspected manufacturing defect is detected within a period of 25% service life of rail in terms of Gross Million Tonne, then investigation will be conducted jointly by purchaser and supplier to ascertain the cause of failure".

Rail Section	Assessed GMT service life for 90 UTS rails
60 Kg	800
52 Kg	525
90 R	375

SN 109
(6)

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)
* * * * *

No.Track/21/2008/0801/7 New Delhi, January 03rd 2013.

Executive Director/Track-I
Executive Director/M&C
RDSO/Lucknow

Managing Director
DFCCIL, New Delhi

Sub: A&C Slip No.3 to Indian Railway's Standard Specification for flat bottom rail IRS-T-12-2009 dated 27.06.2012.

Ref: (i) This office letter of even number dated 22.06.2012.
(ii) ED/Track-I/RDSO's letter No.CT/Specification/T-12 dt.27.06.2012.
(iii) This office letter of even No. dated 03.09.2012.

1. Vide A&C Slip No.3 to Indian Railway's Standard specification for flat bottom rail IRS-T-12-2009 dated 27.06.12, REDA (Revolutional Degassing Activator) system was also permitted for vacuum degassing of liquid steel to reduce the hydrogen content in rails.

2. Subsequent to the issue of the above correction slip, certain representations were received about the reliability of the REDA system of degassing of molten rail steel. Accordingly, in terms of letter under reference No.(iii), the portion of the correction slip no.3, permitting use of REDA for vacuum degassing of liquid steel to reduce the hydrogen content, was kept in abeyance, till such time the REDA process was examined in greater detail.

3. Accordingly, the issue was examined in detail by the Department of Material Sciences, IISC, Bangalore. Based on the recommendations of the IISC, Bangalore which were further scrutinized by officers of RDSO and the Railway Board, the competent authority, i.e. Railway Board (ME) has approved the adoption of REDA system of degassing of molten rail steel, in addition to the RH method of degassing and further approved that the correction slip No.3 to IRS-T-12-2009(issued on 27.06.12 by RDSO) to be brought into force fully.

4. Board(ME) has also advised that stringent quality checks should be carried out w.r.t. hydrogen content in the Rail Steel and, if felt necessary, to suitably increase the sample size/frequency, to set at rest the doubt (efficacy of REDA system) in this regard.

5. Accordingly, correction slip No.3 to the Indian Railways Standard Specification for rail, IRS-T-12-2009 issued by RDSO vide letter under reference no.(ii) dated 27.06.12 has been brought into force fully, thus superseding the letter under reference no.(iii).

3/1/2013

(R.Ramanathan)
Addl. Member (Civil Engg.)
Railway Board

Copy to:

EDWP, Railway Board for information w.r.t. his letter dated 04.09.12 addressed to various Metro Railways. He may address them suitably.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-II REQUIREMENTS

Section 6 – Employer's Requirements (ERQ)

Vol. II – Particular Specifications

Tender Drawings

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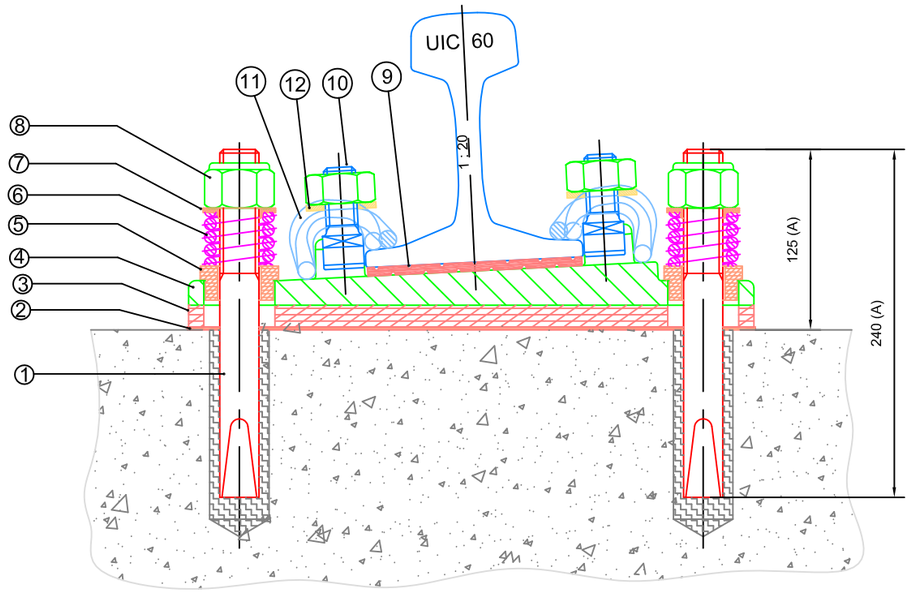
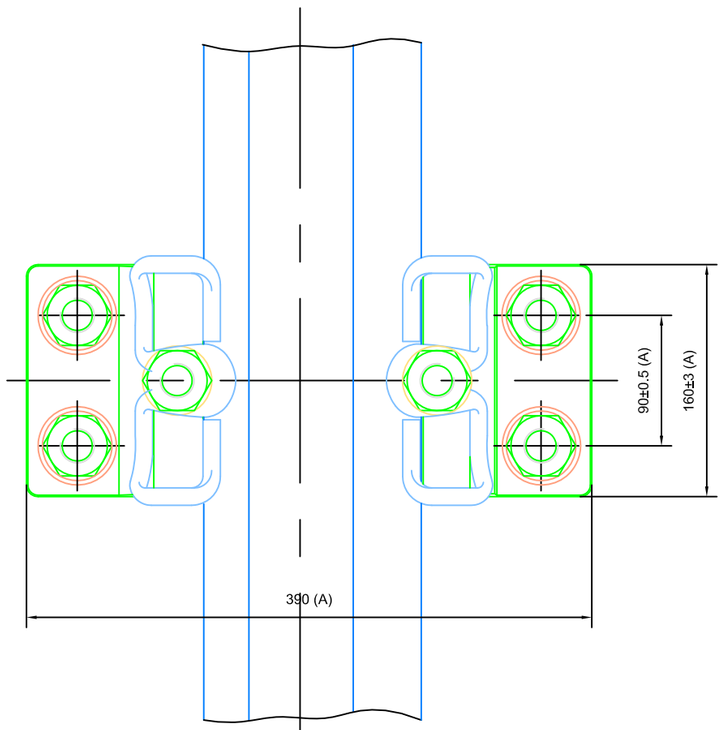
INDEX

Dwg No.	Drawing No.	Drawing Title	Location
1	JFT-01-001	Ballastless Track Fastening Assembly	-
2	JFT-01-BOX TUNNEL-001	Typical Cross Section – Plinth	Box Tunnel
3	JFT-01-BOX TUNNEL-002	Track in Straight Alignment - Equipment on Plinth	
4	JFT-01-BOX TUNNEL-003	Track in Curved Alignment - Equipment on Plinth	
5	JFT-01-BOX TUNNEL-004	Typical Plinth Reinforcement	
6	JFT-01-BOX TUNNEL-005	Shear Connector Details for Plinth	
7	BT-07-TURNOUT	1 In 9 Turnout on slab – General Plan	Turnout
8	BT-07-CIRCULAR TUNNEL-001	Typical Cross Section - Slab	Circular Tunnel
9	BT-07-CIRCULAR TUNNEL-002	Track in Straight Alignment - Equipment on Slab	
10	BT-07-CIRCULAR TUNNEL-003	Track in Curved Alignment - Equipment on Slab	
11	BT-07-CIRCULAR TUNNEL-004	Typical Slab Reinforcement in circular tunnel and in station areas	
12	BT-07-CIRCULAR TUNNEL-005	Shear Connector for Slab in circular tunnel and in station areas	
13	GAD (Sheets)	Chandpole To Badi Chaupar – 5 nos. Sheets	GAD





MATERIAL FOR ONE RAIL SUPPORT

Pos.	Qty.	Description	Material
1	4 / 2	Anchor bolt	Steel
2	1	Pad / Base Plate Shim	Plastic
3	1	Base Plate Elastic Pad	Elastomere
4	1	Cast iron baseplate	Cast iron
5	4 / 2	Insulating bush	Plastic
6	4 / 2	Helical spring	Spring steel
7	4 / 2	Collared washer	Plastic
8	4 / 2	Hexagon nut	Steel
9	1	Rail pad	Plastic
10	2	T- Head bolt with Washer and Nut	Steel
11	2	Tension clamp	Spring steel
12	2	Washer	Steel

Remarks :
These details shall be obtained from the Manufacturer.

Notes :
Dimensions marked as A are indicative.

Toe Load per Clip = 10.5 KN +/- 1.5 KN

Static Creep Resistance of one rail seat assembly not less than 9 KN for UIC 60 Rail

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ALL DIMENSIONS ARE TO BE READ AND NOT MEASURED.
3. ANY DISCREPANCIES MUST BE BROUGHT TO THE NOTICE OF THE CONSULTANT BEFORE EXECUTION OF WORK AT SITE.
4. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL, PLUMBING & FIRE FIGHTING, ELECTRICAL AND TRAFFIC MANAGEMENT DRAWINGS.

THE DRAWINGS IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LTD.

Certified that this document has been designed and checked in accordance with DDC Quality Assurance Plan.

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DELHI METRO RAIL CORPORATION LTD.

PHASE-I SATGE-1 CORRIDOR OF JAIPUR MRTS

BALLASTLESS.TRACK.FASTENING.ASSEMBLY

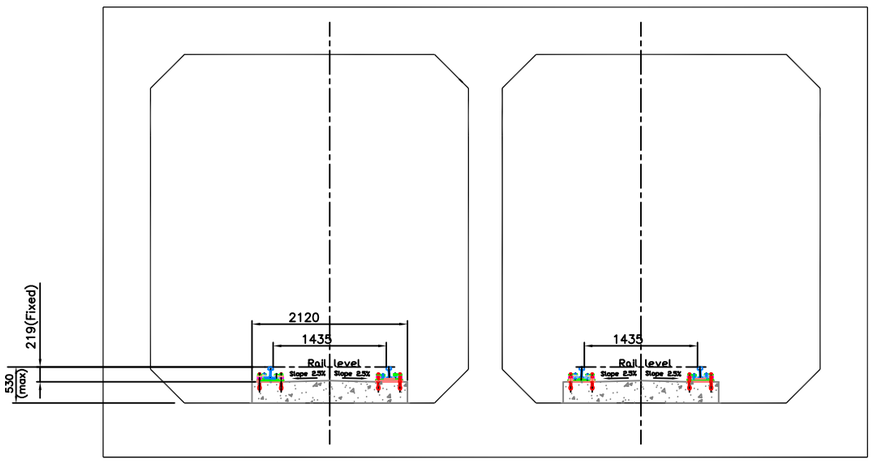
DRAWING NO. JFT-01-001

SCALE. INDICATIVE

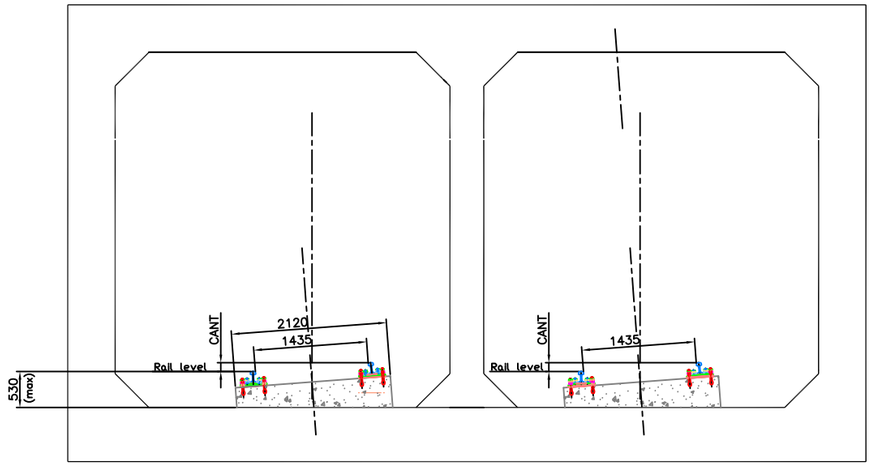
DATE/UPTATE

TRACK

BOX TUNNEL TANGENT TRACK



BOX TUNNEL CURVED TRACK



NOTE:

1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED

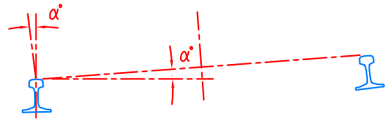
2.-INSTALLATION OF SHEAR CONNECTORS :
SEE DWG BT-07-BOX.TUNNEL-005

3.-PLINTH REINFORCEMENT : SEE DWG BT-07-BOX.TUNNEL-004

4.-FIRST STAGE/SUPPORT CONCRETE : TO BE DONE BY CIVIL CONTRACTOR.

5.-PLINTH CONCRETE : GRADE M35

6.-PRINCIPLE OF ROTATION FOR TRACK IN CURVE



7.-MINIMUM DEPTH OF PLINTH CONCRETE BELOW RAIL SEAT 185MM.

8.- TYPICAL VALUE OF SECOND POUR SLAB DEPTH IS 205mm HOWEVER AT ISOLATED LOCATIONS,THIS DEPTH MAY BE VARRIED UP TO 310mm WITHOUT ANY EXTRA PAYMENT TO FULFILL VAROIUS INTERFACE SYSTEM REQUIRMENTS, TO MAINTANE REQUIRED CLEARANCE/DISTANCES.

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DELHI METRO RAIL CORPORATION LTD.

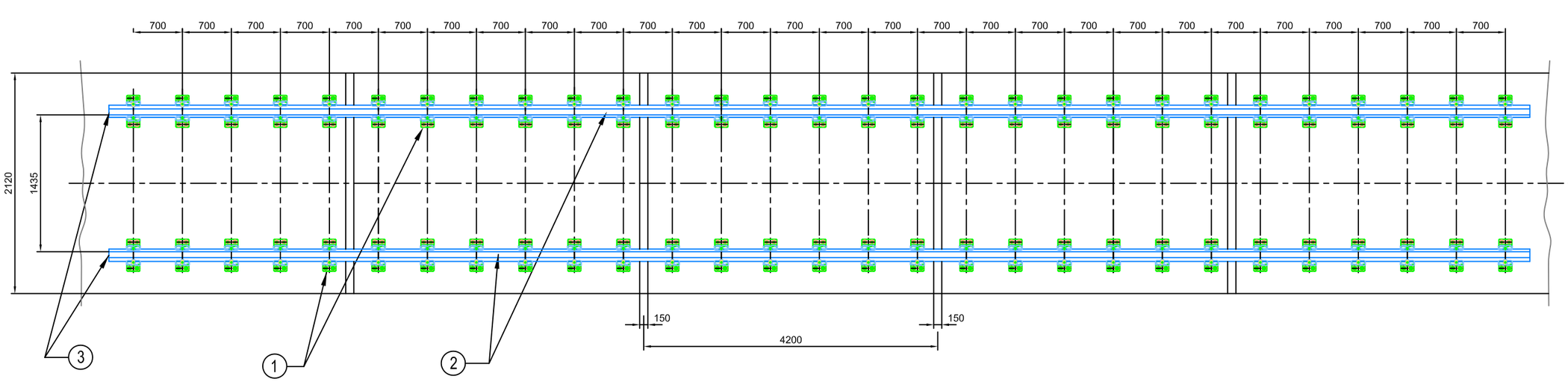
UNDERGROUND.CORRIDOR.TYPICAL.CROSS.SECTION.-.PLINTH.IN.BOX.TUNNEL

DWG. NO. JFT-01-BOX.TUNNEL-001

SCALE INDICATIVE

TRACK

TRACK EQUIPMENT FOR STRAIGHT ALIGNMENT



EQUIPMENT FOR SINGLE TRACK IN BOX TUNNEL

Mark	DESIGNATION
3	WELD
2	RAIL UIC60
1	VOSSLOH FASTENING

NOTE:
1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED
2.-IN THE GAP OF 150MM BETWEEN TWO CONSECUTIVE PLINTH UNITS, APPROPRIATE TRANSVERSE CONCRETE SCREED SHALL BE PROVIDED BY THE CONTRACTOR FOR THE DRAINAGE OF WATER AWAY FROM THE GAP.

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DELHI METRO RAIL CORPORATION LTD.

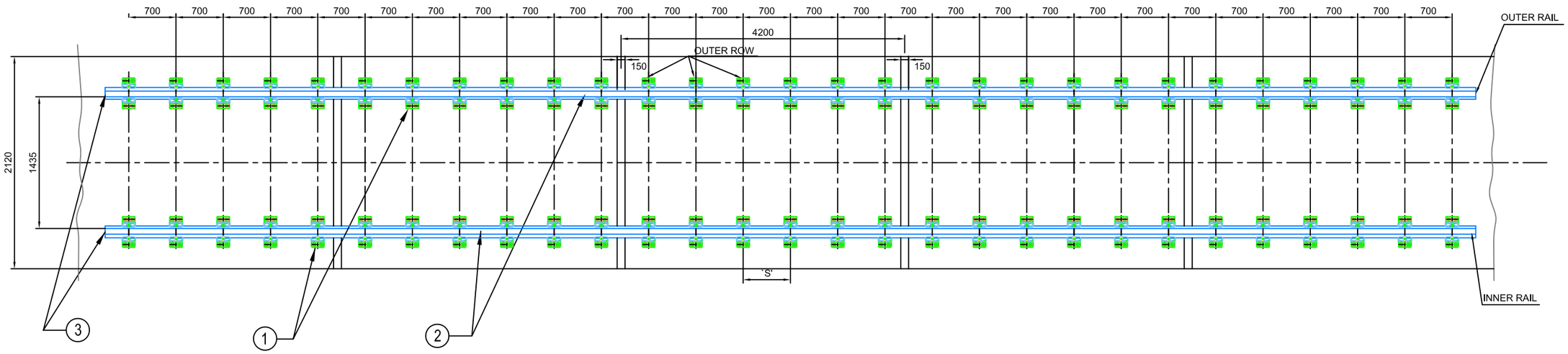
UNDERGROUND.CORRIDOR.TRACK.IN.STRAIGHT.ALIGNMENT.EQUIPMENT.ON.-.PLINTH.IN.BOX.TUNNEL

DWG. NO. JFT-01-BOX.TUNNEL-002

SCALE INDICATIVE

TRACK

TRACK EQUIPMENT FOR CURVED ALIGNMENT



EQUIPMENT FOR SINGLE TRACK IN BOX TUNNEL

Mark	DESIGNATION
3	WELD
2	RAIL UIC60
1	VOSSLOH FASTENING

NOTE:
1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED
2.-IN THE GAP OF 150MM BETWEEN TWO CONSECUTIVE PLINTH UNITS, APPROPRIATE TRANSVERSE CONCRETE SCREED SHALL BE PROVIDED BY THE CONTRACTOR FOR THE DRAINAGE OF WATER AWAY FROM THE GAP.
3.-SPACING 'S' WILL DEPEND UPON RADIUS OF THE CURVE AND 'S' TO BE CALCULATED USING THE FOLLOWING FORMULA

$$'S' = 700 \times \frac{R-1435/2}{R+1435/2}$$

4.-IMAGINARY LINE JOINING CORRESPONDING BASE PLATE OF EACH PLINTH TO BE RADIAL

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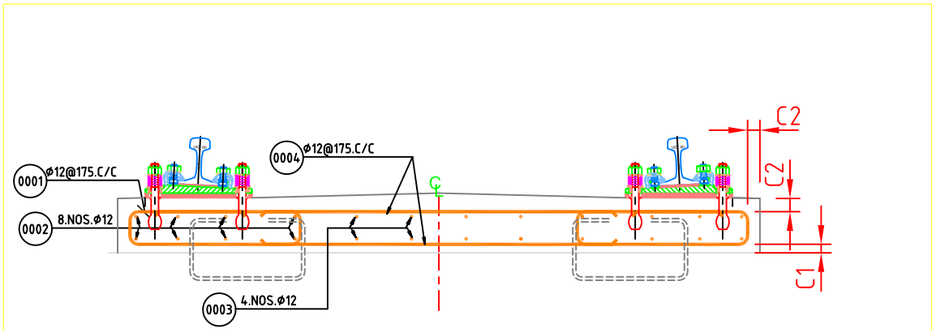
DELHI METRO RAIL CORPORATION LTD.

UNDERGROUND.TRACK.IN.CURVED.ALIGNMENT.EQUIPMENT.ON.-.PLINTH.IN.BOX.TUNNEL

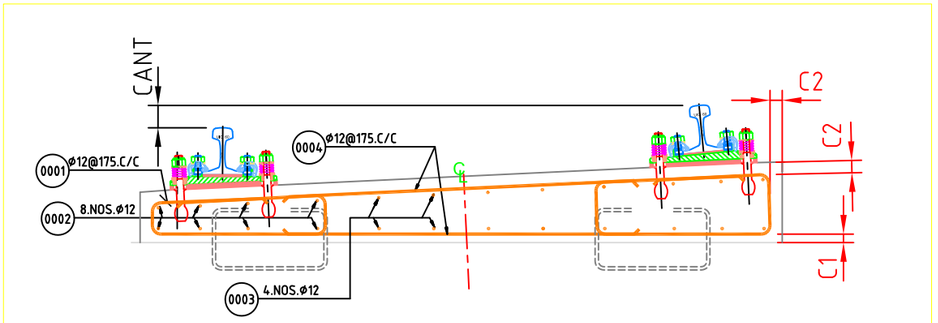
DRG. NO. JFT-01-BOX.TUNNEL-003 SCALE INDICATIVE

TRACK

TYPICAL SECTION OF PLINTH REINFORCEMENT IN STRAIGHT



TYPICAL SECTION OF PLINTH REINFORCEMENT IN CURVE



SCALE : 1/10

NOTE:

1. ALL DIMENSION ARE IN MM UNLESS OTHERWISE NOTED.
2. CONCRETE COVER:
   C1 : 25MM MIN.
   C2 : 45MM MIN.
3. ALL STEEL REINFORCEMENT IS TOR Fe 415 GRADE.
4. ALL PLINTH REINFORCEMENT IS H-12 TYPE

5.-THE SIZE OF REINFORCEMENT WILL BE INCREASED / DECREASED TO SATISHFY FOLLOWING CONDITION FOR CANTED TRACK

a. CONCRETE COVER C1 VARIES FROM 25mm FOR CANT=0 UP TO 55mm FOR CANT=100mm

b. CONCRETE COVER C2 VARIES FROM 45mm FOR CANT=0 UP TO 55mm FOR CANT=100mm

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DELHI METRO RAIL CORPORATION LTD.

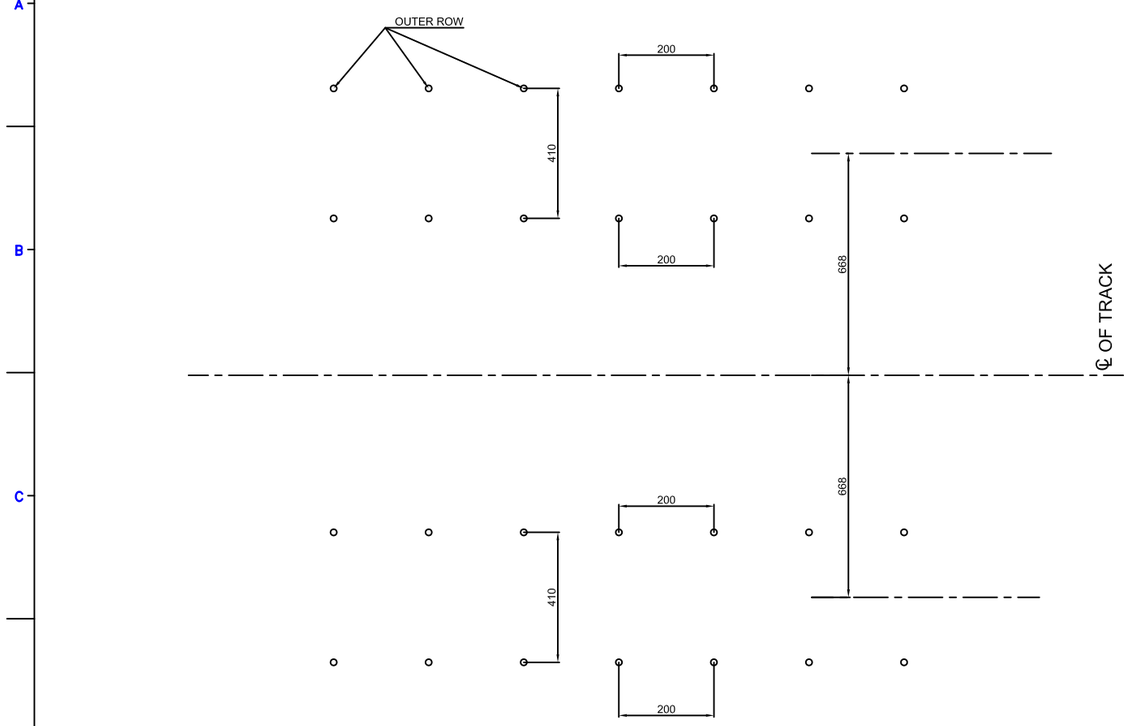
UNDERGROUND.CORRIDOR.-.TYPICAL.PLINTH.REINFORCEMENT.BOX.TUNNEL

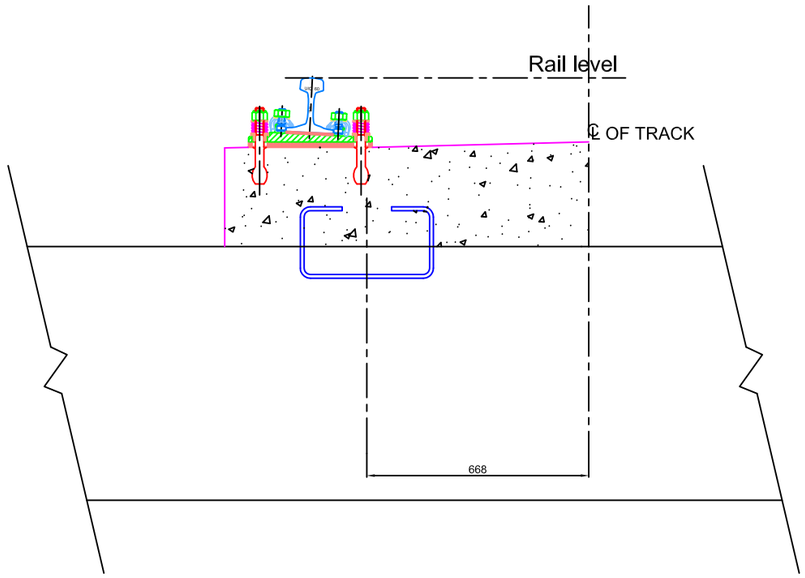
DWG NO. JFT-01-BOX.TUNNEL-004

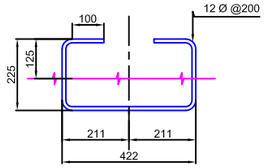
SCALE INDICATIVE

TRACK

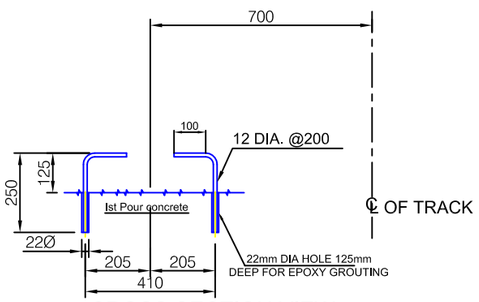
SHEAR CONNECTORS ARRANGEMENT - PLAN VIEW







CROSS SECTION VIEW
(WHERE SHEAR CONNECTORS HAVE BEEN
PROVIDED WITH FIRST POUR/SUPPORT CONCRETE)



CROSS SECTION VIEW
(WHERE SHEAR CONNECTORS HAVE NOT
ALREADY BEEN PROVIDED)

Note :

1. All dimensions are in mm unless otherwise noted.
2. Material of Shear Connector : TOR Fe 415 GRADE

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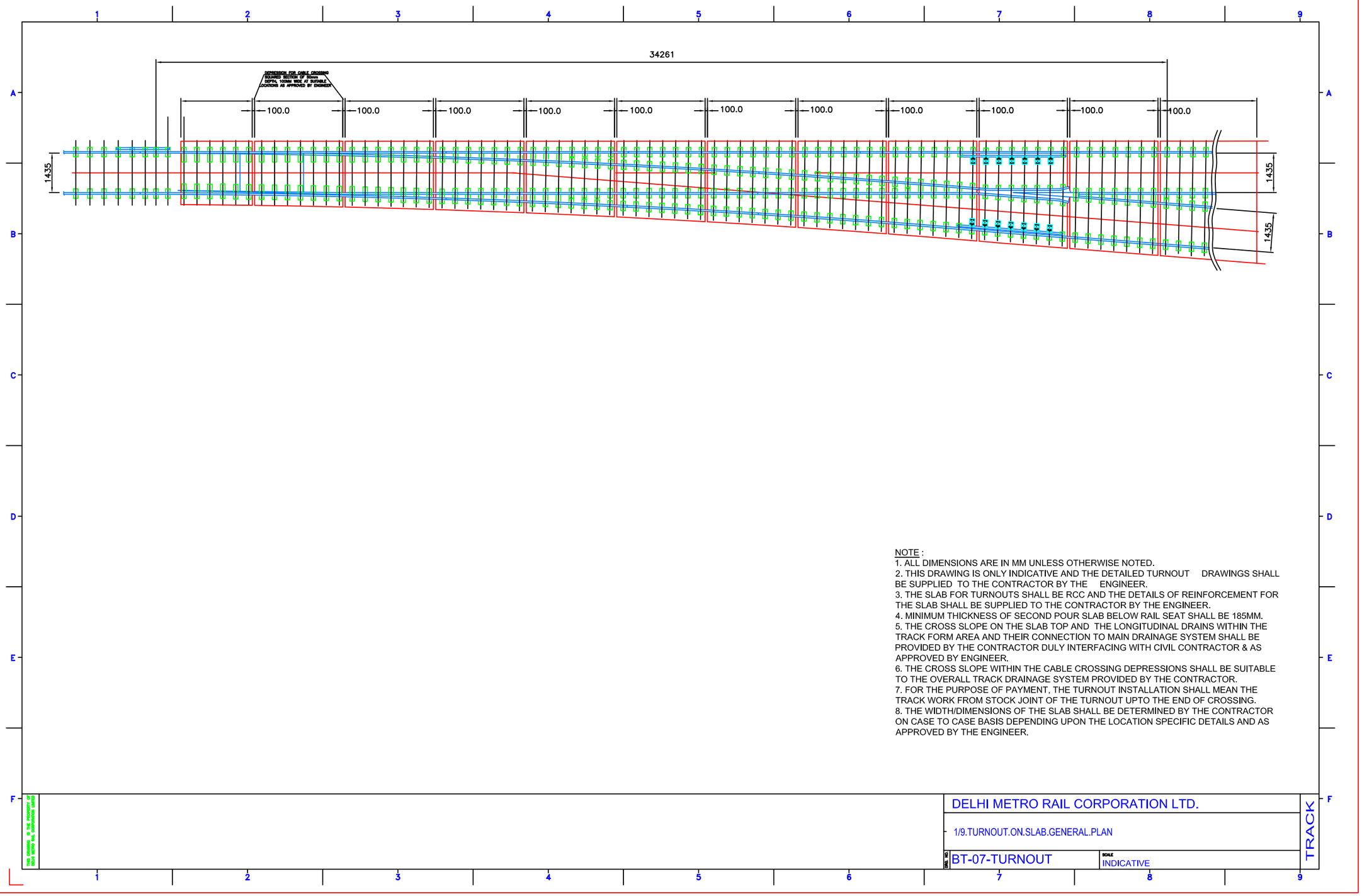
UNDERGROUND.CORRIDOR.SHEAR.CONNECTOR.DETAILS.FOR.PLINTH.IN.BOX.TUNNEL

DRG. NO. JFT-01-BOX.TUNNEL-005

SCALE INDICATIVE

TRACK



NOTE :

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. THIS DRAWING IS ONLY INDICATIVE AND THE DETAILED TURNOUT DRAWINGS SHALL BE SUPPLIED TO THE CONTRACTOR BY THE ENGINEER.
3. THE SLAB FOR TURNOUTS SHALL BE RCC AND THE DETAILS OF REINFORCEMENT FOR THE SLAB SHALL BE SUPPLIED TO THE CONTRACTOR BY THE ENGINEER.
4. MINIMUM THICKNESS OF SECOND POUR SLAB BELOW RAIL SEAT SHALL BE 185MM.
5. THE CROSS SLOPE ON THE SLAB TOP AND THE LONGITUDINAL DRAINS WITHIN THE TRACK FORM AREA AND THEIR CONNECTION TO MAIN DRAINAGE SYSTEM SHALL BE PROVIDED BY THE CONTRACTOR DULY INTERFACING WITH CIVIL CONTRACTOR & AS APPROVED BY ENGINEER.
6. THE CROSS SLOPE WITHIN THE CABLE CROSSING DEPRESSIONS SHALL BE SUITABLE TO THE OVERALL TRACK DRAINAGE SYSTEM PROVIDED BY THE CONTRACTOR.
7. FOR THE PURPOSE OF PAYMENT, THE TURNOUT INSTALLATION SHALL MEAN THE TRACK WORK FROM STOCK JOINT OF THE TURNOUT UPTO THE END OF CROSSING.
8. THE WIDTH/DIMENSIONS OF THE SLAB SHALL BE DETERMINED BY THE CONTRACTOR ON CASE TO CASE BASIS DEPENDING UPON THE LOCATION SPECIFIC DETAILS AND AS APPROVED BY THE ENGINEER.

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

DELHI METRO RAIL CORPORATION LTD.

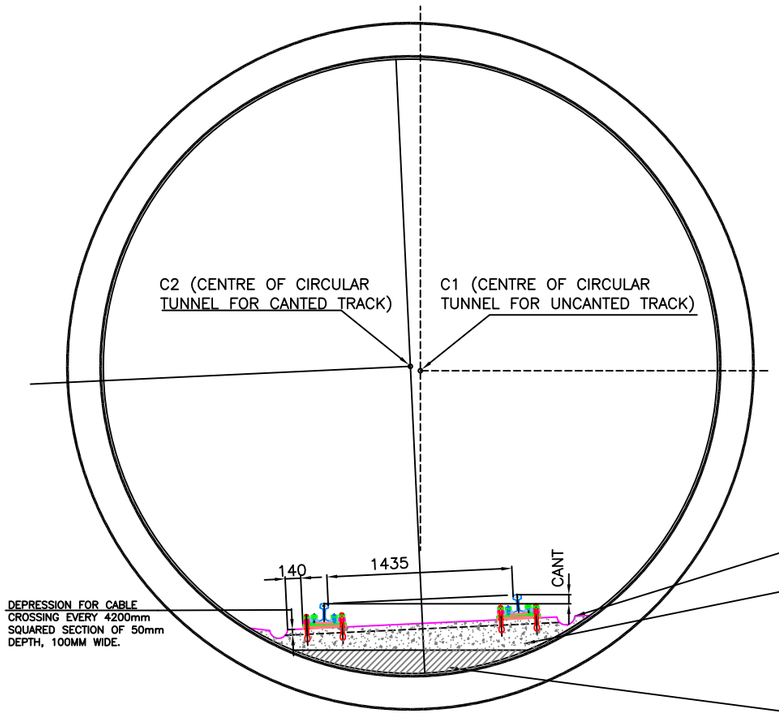
1/9.TURNOUT.ON.SLAB.GENERAL.PLAN

DWG NO. BT-07-TURNOUT

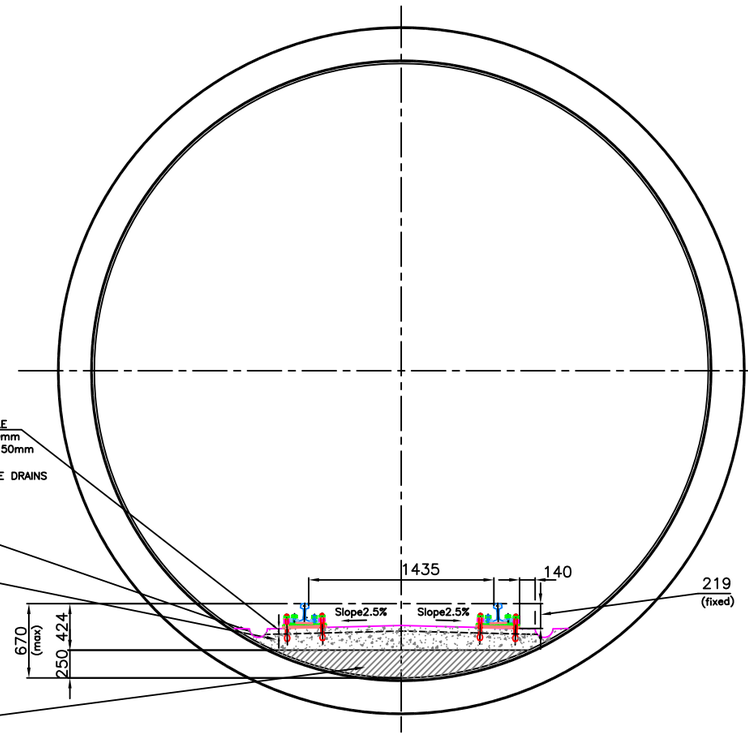
SCALE INDICATIVE

TRACK

CIRCULAR TUNNEL ON CANTED TRACK



CIRCULAR TUNNEL ON TANGENT TRACK



NOTE:

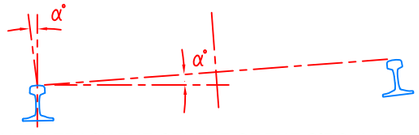
1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.

2.-INSTALLATION OF SHEAR CONNECTORS :
SEE DWG BT-07-CIRCULAR TUNNEL-005

3.-SLAB REINFORCEMENT : SEE DWG BT-07-CIRCULAR TUNNEL-004

4.-SLAB CONCRETE : GRADE M35

5.-PRINCIPLE OF ROTATION FOR TRACK IN CURVE



6.-ON CANTED TRACK THE CENTRE OF THE CIRCULAR TUNNEL WILL BE SHIFTED LATERALY & VERTICALLY WITH RESPECT TO ITS POSITION WITHOUT CANT AND THE VALUES OF THESE SHIFTS SHALL BE OBTAINED BY THE CONTRACTOR FROM CIVIL CONTRACTOR DULY INTERFACING

7.- MINIMUM THICKNESS OF SECOND POUR SLAB BELOW RAIL SEAT IS 175MM.

8.- CROSS SLOPE ON THE SLAB TOP & LONGITUDINAL DRAINS AS SHOWN ABOVE SHALL BE PROVIDED BY CONTRACTOR IN CIRCULAR TUNNEL.

9.- TRACK FORM IN STATION AREAS (CIRCULAR/BOX TUNNEL) SHALL ALSO BE RCC SLAB TYPE. ON THESE LOCATIONS THE WIDTH/DIMENSIONS OF THE SLAB AND ALSO THE LONGITUDINAL & CROSS DRAINAGE WITHIN THE TRACK WORK & ITS CONNECTION TO MAIN DRAINAGE SYSTEM (TO BE PROVIDED BY CIVIL CONTRACTOR) SHALL BE DONE BY THE CONTRACTOR DULY INTERFACING WITH THE CIVIL CONTRACTOR AND AS APPROVED BY THE ENGINEER.

10.- TYPICAL VALUE OF SECOND POUR SLAB DEPTH IS 205mm HOWEVER AT ISOLATED LOCATIONS,THIS DEPTH MAY BE VARRIED UP TO 310mm WITHOUT ANY EXTRA PAYMENT TO FULFILL VAROIUS INTERFACE SYSTEM REQUIRMENTS, TO MAINTANE REQUIRED CLEARANCE/DISTANCES.

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

DELHI METRO RAIL CORPORATION LTD.

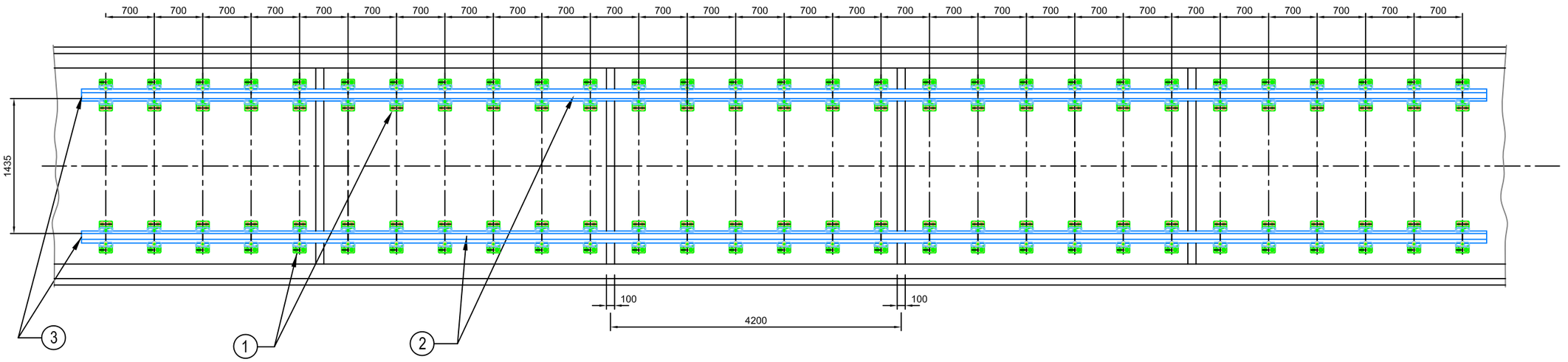
UNDERGROUND.TYPICAL.CROSS.SECTIONS.-.SLAB.IN.CIRCULAR.TUNNEL

DWG. NO. BT-07-CIRCULAR.TUNNEL-001

SCALE INDICATIVE

TRACK

TRACK EQUIPMENT FOR STRAIGHT ALIGNMENT



EQUIPMENT FOR SINGLE TRACK IN CIRCULAR TUNNEL

Mark	DESIGNATION
3	WELD
2	RAIL UIC60
1	VOSSLOH FASTENING

NOTE:
1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED
2.-DEPRESSION FOR CABLE CROSSING EVERY 4200 MM SQUARED SECTION OF 50MM DEPTH, 100MM WIDE SLOPING TOWARDS SIDE DRAINS SHALL BE PROVIDED BY THE CONTRACTOR.
3.- THE EXPANSION JOINT IN RCC SLAB TO BE PROVIDED BY THE CONTRACTOR SHALL COINCIDE WITH SUCH JOINTS PROVIDED BY CIVIL CONTRACTOR DULY APPROVED BY THE ENGINEER.

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

DELHI METRO RAIL CORPORATION LTD.

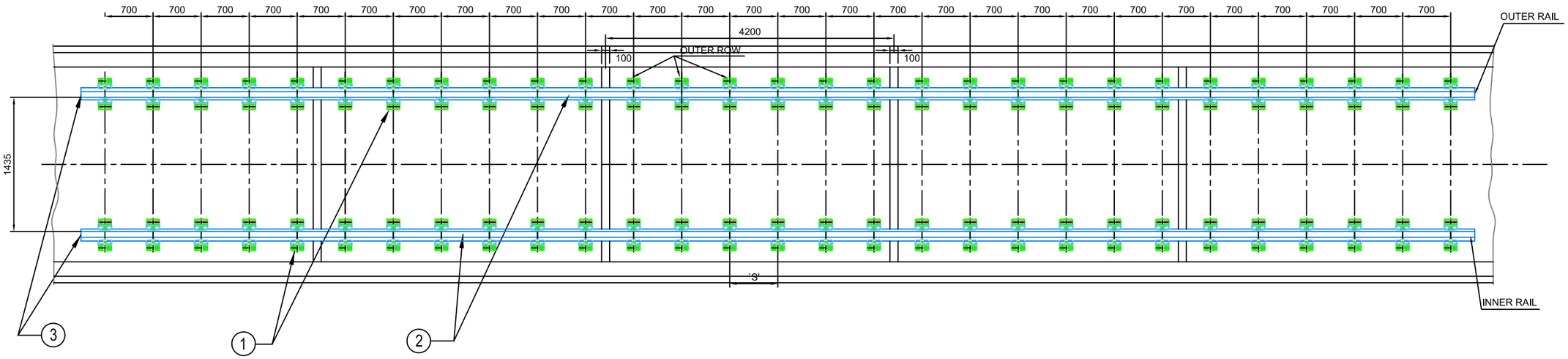
UNDERGROUND.CORRIDOR.TRACK.IN.STRAIGHT.ALIGNMENT.EQUIPMENT.ON.-.SLAB.IN.CIRCULAR.TUNNEL

DRG. NO: BT-07-CIRCULAR.TUNNEL-002

SCALE: INDICATICVE

TRACK

TRACK EQUIPMENT FOR CURVED ALIGNMENT



EQUIPMENT FOR SINGLE TRACK IN CIRCULAR TUNNEL

Mark	DESIGNATION
3	WELD
2	RAIL UIC60
1	VOSSLOH FASTENING

NOTE:

1.-ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED

2.-DEPRESSION FOR CABLE CROSSING EVERY 4200 MM SQUARED SECTION OF 50MM DEPTH, 100MM WIDE SHALL BE PROVIDED BY THE CONTRACTOR.

3.- THE EXPANSION JOINT IN RCC SLAB TO BE PROVIDED BY THE CONTRACTOR SHALL COINCIDE WITH SUCH JOINTS PROVIDED BY CIVIL CONTRACTOR DULY APPROVED BY THE ENGINEER.

4.-SPACING 'S' WILL DEPEND UPON RADIUS OF THE CURVE AND 'S' TO BE CALCULATED USING THE FOLLOWING FORMULA

$$'S' = 700 \times \frac{R-1435/2}{R+1435/2}$$

5.-IMAGINARY LINE JOINING CORRESPONDING BASE PLATE OF EACH PLINTH TO BE RADIAL

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

DELHI METRO RAIL CORPORATION LTD.

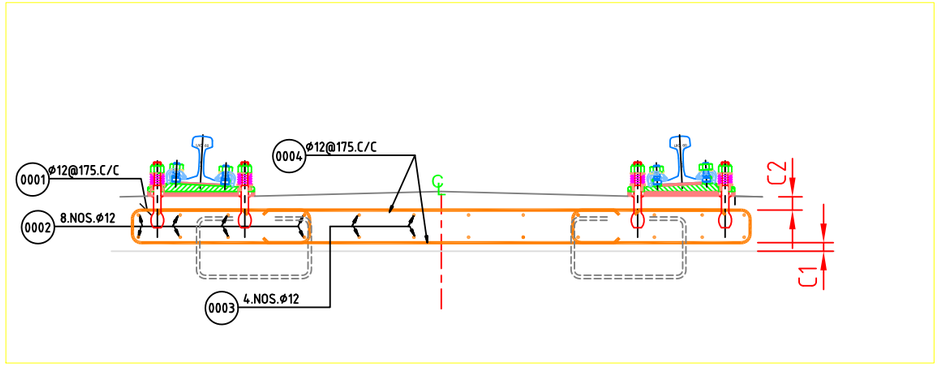
UNDERGROUND.CORRIDOR.TRACK.IN.CURVED.ALIGNMENT.EQUIPMENT.ON.-.SLAB.IN.CIRCULAR.TUNNEL

DWG. NO. BT-07-CIRCULAR.TUNNEL-003

SCALE INDICATIVE

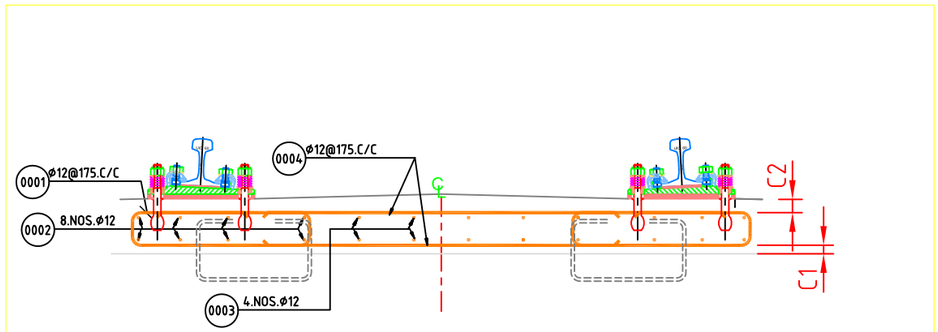
TRACK

TYPICAL SECTION OF SLAB REINFORCEMENT IN STRAIGHT



SCALE : 1/10

TYPICAL SECTION OF SLAB REINFORCEMENT IN CURVE



SCALE : 1/10

NOTE:

1. ALL DIMENSION ARE IN MM UNLESS OTHERWISE NOTED.
2. CONCRETE COVER:
   C1 : 25MM MIN.
   C2 : 45MM MIN.
3. ALL STEEL REINFORCEMENT IS TOR Fe 415 GRADE.
4. ALL PLINTH REINFORCEMENT IS H-12 TYPE

5.-THE SIZE OF REINFORCEMENT WILL BE INCREASED / DECREASED

TO SATISHFY FOLLOWING CONDITION FOR CANTED TRACK

a. CONCRETE COVER C1 VARIES FROM 25mm FOR CANT=0

UP TO 55mm FOR CANT=100mm

b. CONCRETE COVER C2 VARIES FROM 45mm FOR CANT=0

UP TO 55mm FOR CANT=100mm

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

DELHI METRO RAIL CORPORATION LTD.

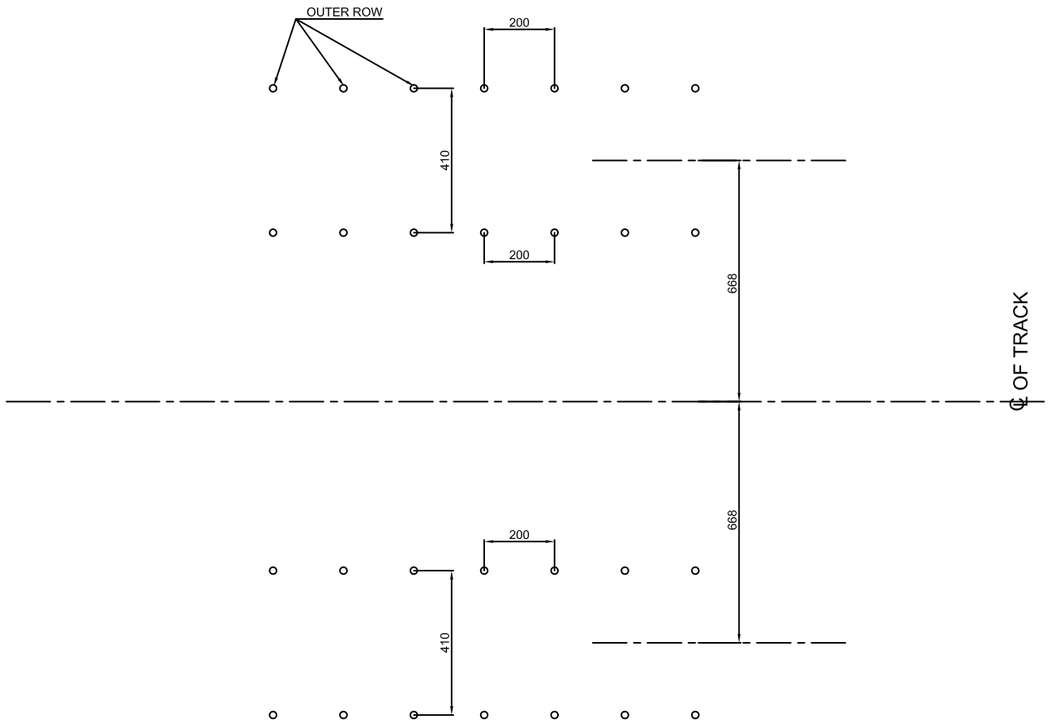
UNDERGROUND.CORRIDOR.-.TYPICAL.SLAB.REINFORCEMENT.IN.CIRCULAR.TUNNEL.&.IN.STATION.AREAS

DWG NO. BT-07-CIRCULAR.TUNNEL-004

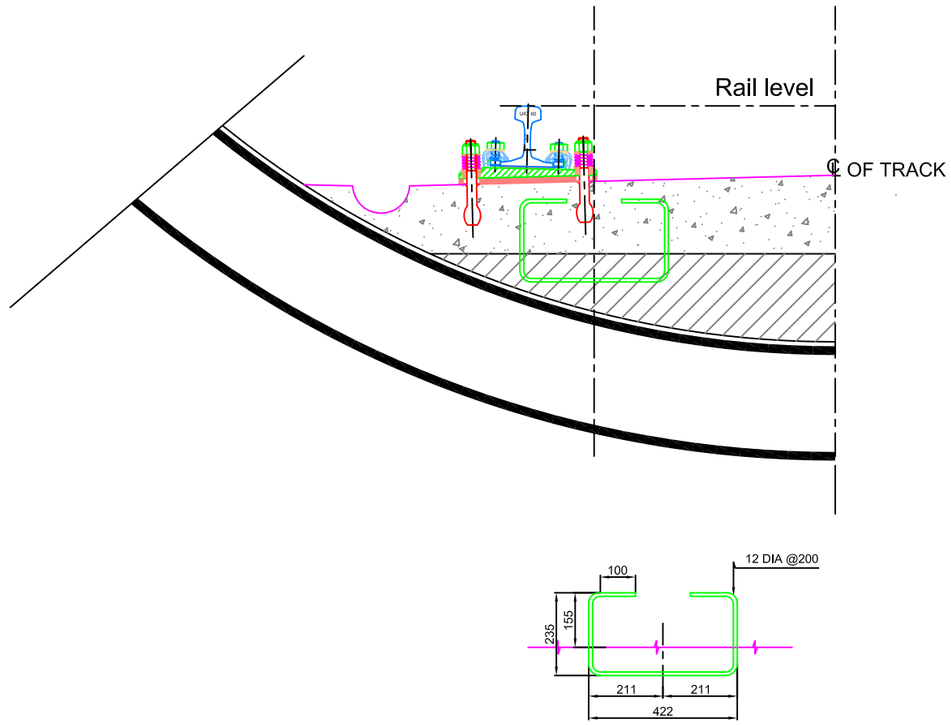
SCALE INDICATIVE

TRACK

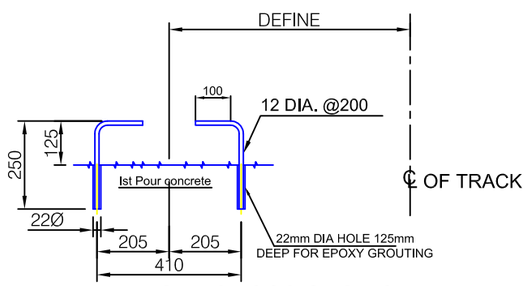
SHEAR CONNECTORS ARRANGEMENT - PLAN VIEW



TYPICAL DETAIL



TYPICAL CROSS SECTION VIEW
(WHERE SHEAR CONNECTORS HAVE BEEN
PROVIDED WITH FIRST POUR CONCRETE)



TYPICAL CROSS SECTION VIEW
(WHERE SHEAR CONNECTORS HAVE NOT
ALREADY BEEN PROVIDED)

Note :

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. MATERIAL OF SHEAR CONNECTOR : TOR Fe 415 GRADE
3. THE ACTUAL DETAILS AND THE DIMENSIONS OF THE SHEAR CONNECTORS, WHERE ALREADY PROVIDED, SHALL BE OBTAINED BY THE CONTRACTOR FROM THE CIVIL CONTRACTOR DULY INTERFACING.
4. THE DISTANCE OF SHEAR CONNECTORS FROM CENTRE OF THE TRACK SHALL BE DEFINED BY THE CONTRACTOR AT THE LOCATIONS WHERE SHEAR CONNECTORS HAVE NOT ALREADY BEEN PROVIDED DULY APPROVED BY ENGINEER.

THIS DRAWING IS THE PROPERTY OF DELHI METRO RAIL CORPORATION LIMITED

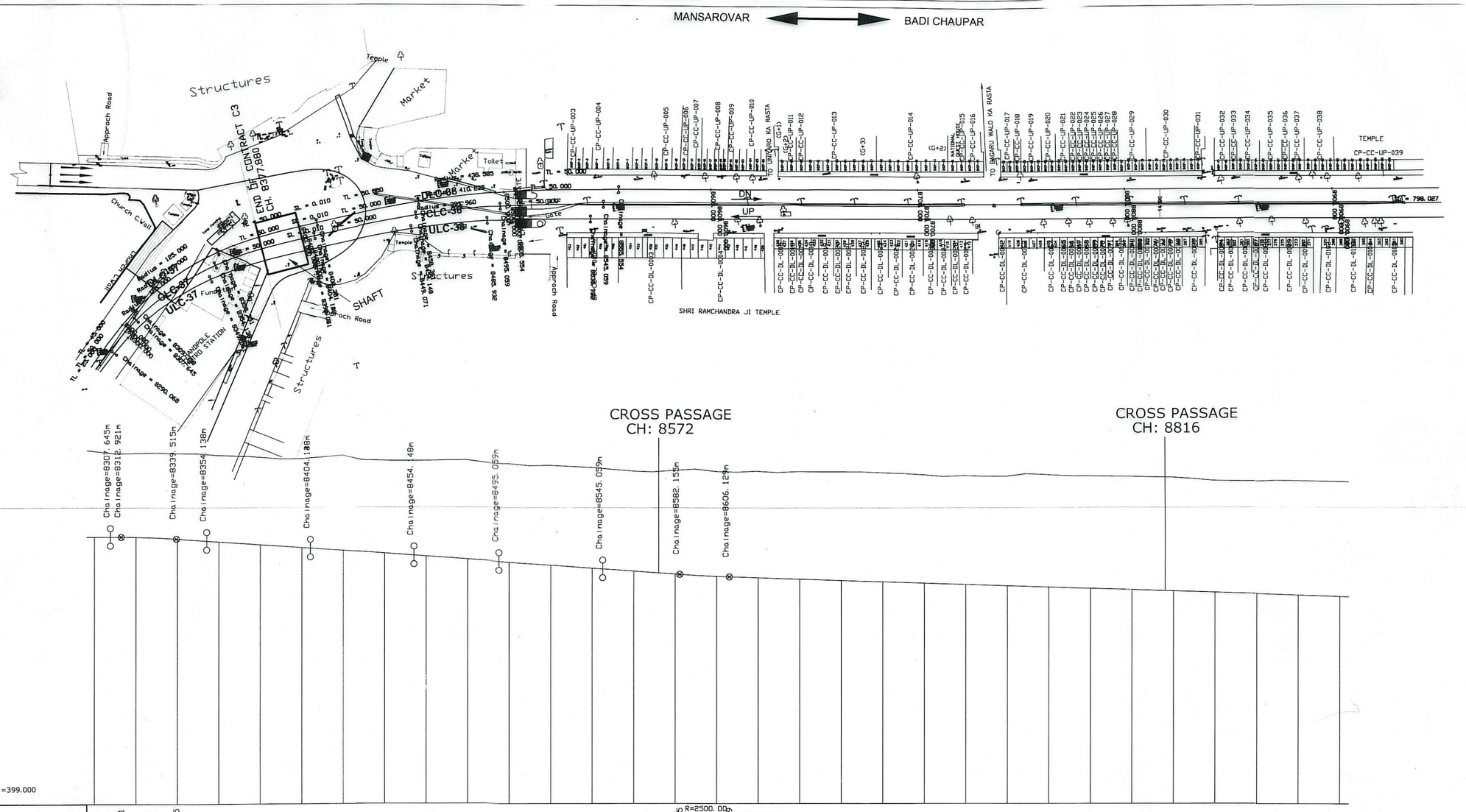
DELHI METRO RAIL CORPORATION LTD.

UNDERGROUND,CORRIDOR,SHEAR,CONNECTOR,FOR,SLAB,IN,CIRCULAR,TUNNEL,AND,IN,STATION,AREAS

DRG. NO. BT-07-CIRCULAR.TUNNEL-005

SCALE INDICATIVE

TRACK



KEY PLAN :-

LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
ROAD		SIGNAL & LAMP POLE	
DEVIDER		SIGNAL POLE	
FOOTPATH		ELEC. LINE & POLE	
BOUNDARY WALL		ELEC. BOX	
BUILDING		BUSH. BUSH BOX	
SHED		TELEPHONE POLE	
NALLAH/DRAIN		TRANSFORMER	
FENCING		HT LINE & POLE	
TEMPLE		TUBE WELL & WELL	
MANE HOLE		GATE	
TREE		KM. STONE	
HAND PUMP		S.B. & G.B	
		RAILWAY TRACK	

CURVE DETAIL

Curve No	Direction	Start Chainage	Radius	Transition Length		Tangent Length	Curve Length	Total Curve Length	Straight	Ca	cd	Maximum permissible speed
38	Right	8454.1480	410.235	50.000	50.000	20.472	40.911	140.911	791.806	85	85	75

DMRC										JMRC	
S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature
						CE / PLG		DY /CE / PLG.		1.	DIRECTOR PROJECT	
						CGM / Track		DY /CE / Track		2.	EXECUTIVE DIRECTOR	
	CA		DYCA									
	ED/S&T/Proj. - I		DGM/S&T/JP			PD / JP		RE/				

REVISIONS

NO.	REV NO.	DESCRIPTION	APP
10	R4	Location of Cross Passage modified	
9		Cross Passage indicated	
8		Dead end extended	
7		"Y" siding introduced for reversal line	
6		Rail level of Chotti Chaupar and Badi Chaupar modified	
5	R3	UP and DN center line modified	
4		Alignment modified on revised topographical survey	
3		Center line of stations modified	
2	R2	Up track and down track center line introduced	
1	R1	Vertical alignment modified	

DELHI METRO RAIL CORPORATION LTD.

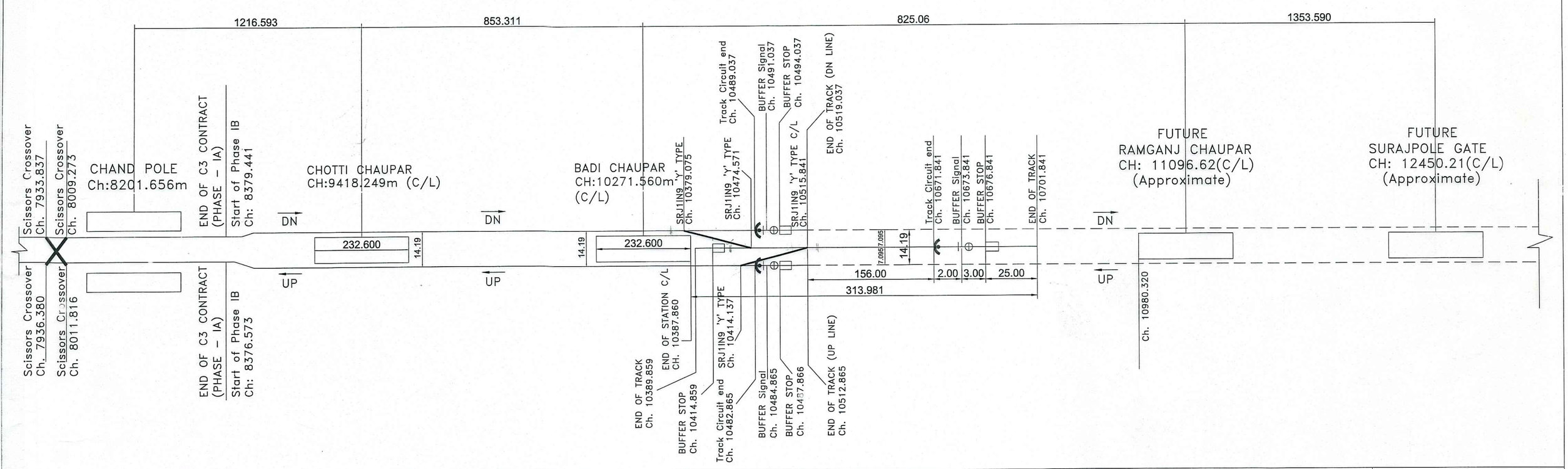
TITLE: GENERAL ALIGNMENT DRAWING OF JAIPUR METRO

APPROVED BY	DESIGN BY	DRAWN BY
SANJEEV MALIK	R.G.SHARMA	JITENDRA SINGH

DATE	REV	SCALE
16.03.2016	R4	0 5 10 15 25 50m

DRAWING NO: JMRC/JP/EW1B/C1 GAD/ 2015-2016 | SHEET NO: 1 of 4 | SHEET SIZE:

EAST - WEST CORRIDOR FROM
CHANDPOLE TO BADI CHAUPAR (PHASE - IB)



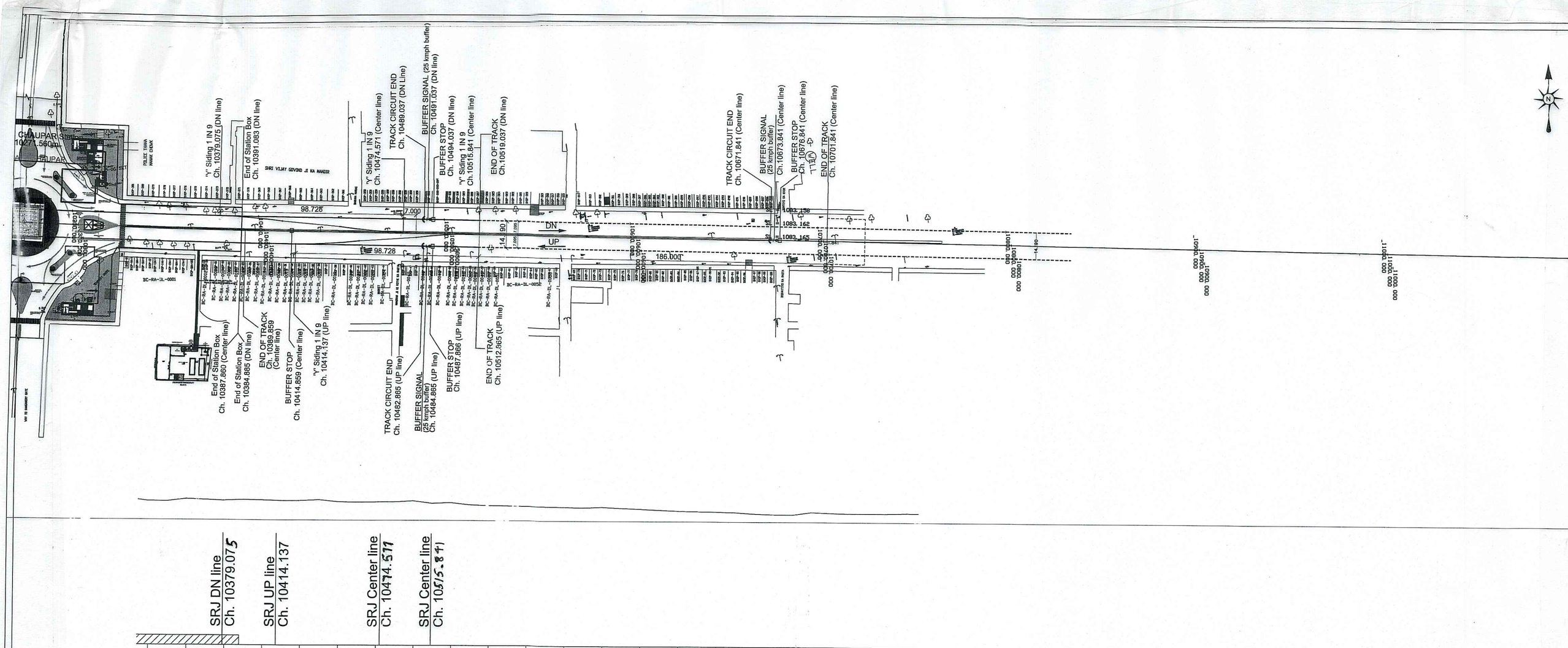
JMRC		
S.No	Designation	Signature
1.	DIRECTOR PROJECT	
2.	EXECUTIVE DIRECTOR	

LEGENDS		
S.No.	Symbol	Item
1.		Track Circuit end
2.		Buffer Signal
3.		Buffer Stop

APPROVED BY GC					
S.No.	Designation	Signature	S.No.	Designation	Signature
				CE / Track	
	ED (S&T)/I				
	CE / PLG			PD / JP	
	ED / Traction / JP			Sr. DEN/SRT	
	CA			DY CAO	

DELHI METRO RAIL CORPORATION LTD.
Metro Bhawan 13, Fire Brigade Lane, Barakhamba Road, New Delhi-110001

TITLE:-	TRACK PLAN CHANDPOLE TO BADI CHAUPAR (PHASE - IB) OF JAIPUR METRO	
APPROVED BY:-	DESIGN BY:-	DRAWN BY:-
SANJEEV MALIK		Jitendra Singh
DATE:- 08.04.2016	REV:- R0	SCALE:- N.T.S.
DRAWING NO.:- DMRC/JP/1B/Track Alignment		SHEET SIZE



KEY PLAN :-

LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
ROAD		SODIUM & LAMP POLE	
DIVIDER		SIGNAL POLE	
FOOTPATH		ELEC. LINE & POLE	
BOUNDARY WALL		ELEC. BOX	
BUILDING		DUST BIN BOX	
SHED		TELEPHONE POLE	
NALLAH/DRAIN		TRANSFORMER	
FENCING		HT LINE & POLE	
TEMPLE		TUBE WELL & WELL	
NAME HOLE		GATE	
TREE		KM STONE	
HAND PUMP		SR. & GLR	
		RAILWAY TRACK	

CURVE DETAIL

Curve No	Direction	Start Chainage	Radius	Transition Length		Tangent Length	Curve Length	Total Curve Length	Straight	Ca	cd	Maxi mum permissible speed
41	Right	9944.4490	10000.000	20.000	20.000	17.722	174.989	214.989	1083.162	0	7	80

DMRC

S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature	Designation	Signature
						CE / PLG		DY /CE / PLG.	
						CGM / Track		DY /CE / Track	
	CA		DYCA						
	ED/S&T/Proj. - I		DGM/S&T/JP			PD / JP		RE/ WS	

JMRC

S.No.	Designation	Signature
1.	DIRECTOR PROJECT	
2.	EXECUTIVE DIRECTOR	

REVISIONS

NO.	REV.NO.	DESCRIPTION	APP
10.	R4	Location of Cross Passage modified.	
9.		Cross Passage Indicated.	
8.		Dead end extended.	
7.		"Y" siding introduced for reversal line.	
6.		Rail level of Chotti Chaupar and Badi Chaupar modified.	
5.	R3	UP and DN center line modified.	
4.		Alignment modified on revised topographical survey.	
3.		Center line of stations modified.	
2.	R2	Up track and down track center line introduced.	
1.	R1	Vertical alignment modified.	

DELHI METRO RAIL CORPORATION LTD.

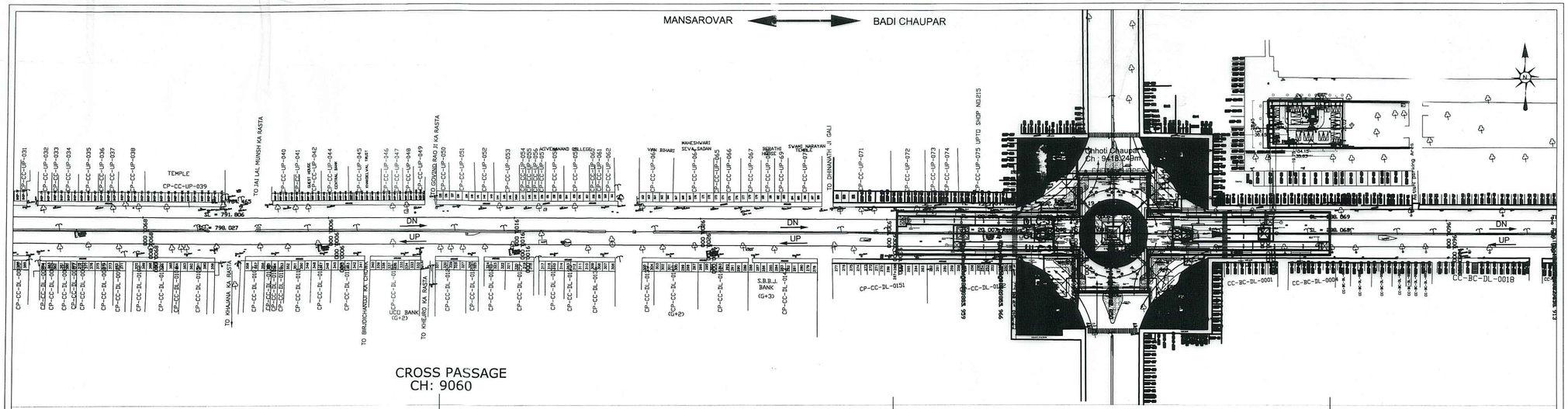
TITLE:- GENERAL ALIGNMENT DRAWING OF JAIPUR METRO

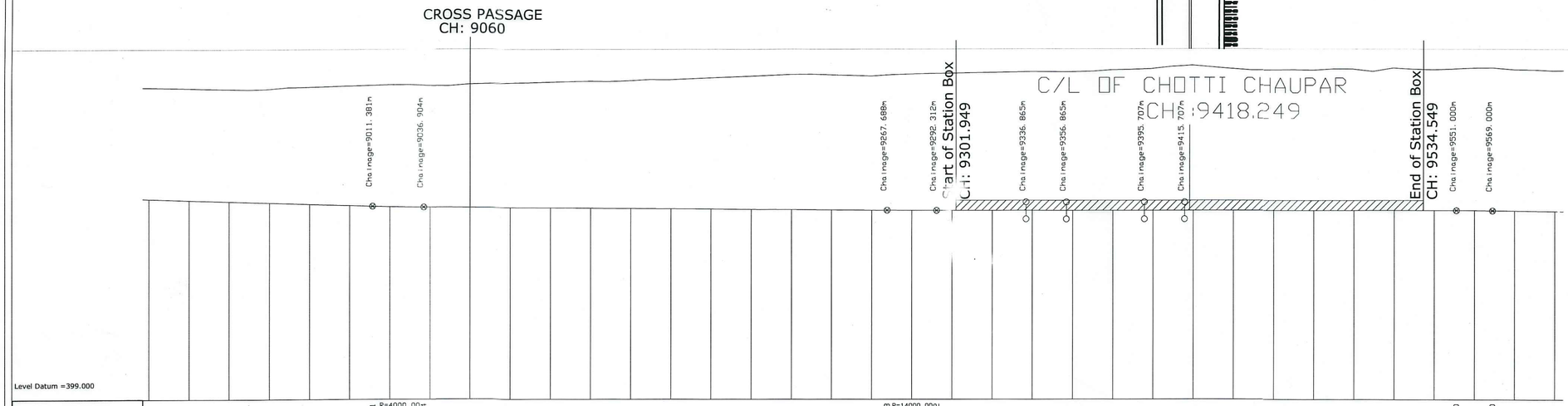
APPROVED BY:-	DESIGN BY:-	DRAWN BY:-
SANJEEV MALIK	R.G.SHARMA	JITENDRA SINGH

DATE:-	REV:-	SCALE:-
16.03.2016	R4	0 5 10 15 25 50m

DRAWING NO:- JMRC/JP/EW/1B/C1 GAD/ 2015-2016

SHEET NO. 4 of 4 | SHEET SIZE





ELEVATION DIFF.	RAIL LEVELS	GROUNDLEVELS	CHAINAGE
-13.905	424.010	437.916	8900.000
-13.970	423.848	437.817	8920.000
-14.032	423.685	437.717	8940.000
-14.194	423.522	437.717	8960.000
-14.611	423.359	437.970	8980.000
-14.907	423.197	438.103	9000.000
-15.190	423.043	438.233	9020.000
-15.172	422.972	438.145	9040.000
-15.357	422.937	438.293	9060.000
-15.528	422.902	438.429	9080.000
-15.698	422.867	438.565	9100.000
-15.862	422.831	438.694	9120.000
-15.959	422.796	438.756	9140.000
-16.124	422.761	438.886	9160.000
-16.368	422.726	439.094	9180.000
-16.617	422.691	439.307	9200.000
-16.862	422.656	439.517	9220.000
-16.853	422.620	439.474	9240.000
-16.735	422.585	439.321	9260.000
-17.004	422.555	439.560	9280.000
-17.110	422.550	439.660	9300.000
-17.203	422.550	439.753	9320.000
-17.300	422.550	439.850	9340.000
-17.276	422.550	439.826	9360.000
-17.527	422.550	440.077	9380.000
-17.687	422.550	440.237	9400.000
-18.086	422.550	440.637	9420.000
-17.669	422.550	440.220	9440.000
-17.535	422.550	440.086	9460.000
-17.529	422.550	440.079	9480.000
-17.638	422.550	440.189	9500.000
-17.776	422.550	440.326	9520.000
-17.585	422.550	440.136	9540.000
-17.796	422.543	440.339	9560.000
-17.652	422.490	440.143	9580.000
-17.572	422.430	440.002	9600.000

KEY PLAN :-



LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
ROAD		SODIUM & LAMP POLE	
DIVIDER		SIGNAL POLE	
FOOTPATH		ELEC. LINE & POLE	
BOUNDARY WALL		ELEC. BOX	
BUILDING		POST BOX BOX	
SHED		TELEPHONE POLE	
WALL/GRASH		TRANSFORMER	
FENCING		HT LINE & POLE	
TEMPLE		TUBE WELL & WELL	
NAME HERE		GATE	
TREE		KM. STONE	
HAND PUMP		S.R. & DLR	
		RAILWAY TRACK	

CURVE DETAIL

Curve No	Direction	Start Chainage	Radius	Transition Length		Tangent Length	Curve Length	Total Curve Length	Straight	Ca	cd	Maximum permissible speed
39	Right	9356.8850	10000.000	20.000	20.000	17.722	38.842	78.842	238.069	0	6	70

DMRC

S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature	Designation	Signature
						CE / PLG		DY /CE / PLG.	
						CGM / Track		DY /CE / Track	
	CA		DYCA						
	ED/S&T/Proj. - I		DGM/S&T/JP			PD / JP		RE/OS	

JMRC

S.No.	Designation	Signature
1.	DIRECTOR PROJECT	
2.	EXECUTIVE DIRECTOR	

REVISIONS

NO.	REV NO.	DESCRIPTION
10.	R4	Location of Cross Passage modified.
9.		Cross Passage Indicated.
8.		Dead end extended.
7.		'Y' siding introduced for reversal line.
6.		Rail level of Chotti Chaupar and Badi Chaupar modified.
5.	R3	UP and DN center line modified.
4.		Alignment modified on revised topographical survey.
3.		Center line of stations modified.
2.	R2	Up track and down track center line introduced.
1.	R1	Vertical alignment modified.

APP.

DELHI METRO RAIL CORPORATION LTD.

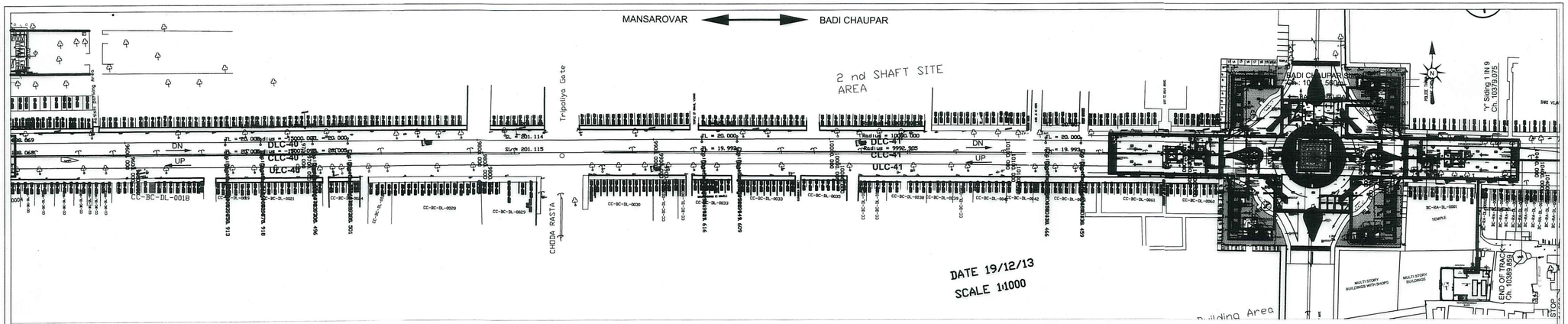
TITLE:- GENERAL ALIGNMENT DRAWING OF JAIPUR METRO

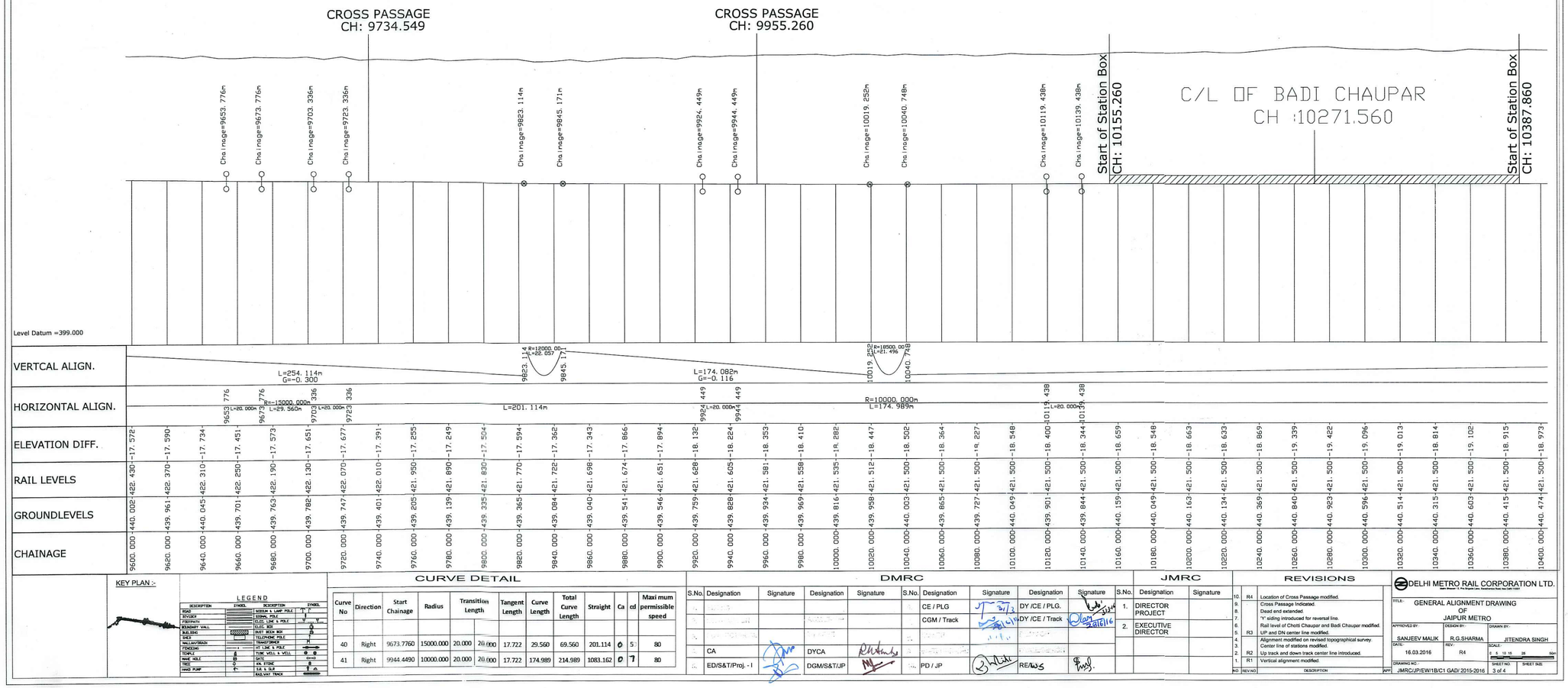
APPROVED BY:-	DESIGN BY:-	DRAWN BY:-
SANJEEV MALIK	R.G.SHARMA	JITENDRA SINGH
DATE:- 16.03.2016	REV:- R4	SCALE:- 0 5 10 15 25 50m

DRAWING NO.:- JMRC/JP/EW/1B/C1 GAD/ 2015-2016

SHEET NO. 2 of 4

SHEET SIZE





KEY PLAN :-

LEGEND

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
ROAD		MERCURY VAPOUR LAMP POLE	
BRIDGE		SIGNAL POLE	
FOOTPATH		ELEC. LINE & POLE	
BOUNDARY WALL		ELEC. BOX	
BUILDING		DUCT BANK MH	
SHED		TELEPHONE POLE	
NALLAH/DRAIN		TRANSFORMER	
FENCING		HT LINE & POLE	
TEMPLE		TUBE WELL & WELL	
RAISE HOLE		GATE	
TREE		KM. STONE	
HAND PUMP		LX & SLP	
		RAILWAY TRACK	

CURVE DETAIL

Curve No	Direction	Start Chainage	Radius	Transition Length		Tangent Length	Curve Length	Total Curve Length	Straight	Ca	cd	Maximum permissible speed
40	Right	9673.7760	15000.000	20.000	20.000	17.722	29.560	69.560	201.114	0	5	80
41	Right	9944.4490	10000.000	20.000	20.000	17.722	174.989	214.989	1083.162	0	7	80

DMRC

S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature	Designation	Signature	S.No.	Designation	Signature
						CE / PLG		DY /CE / PLG.		1.	DIRECTOR PROJECT	
						CGM / Track		DY /CE / Track		2.	EXECUTIVE DIRECTOR	
	CA		DYCA									
	ED/S&T/Proj. - I		DGM/S&T/JP			PD / JP		RE/WS				

JMRC

REVISIONS

NO	REV.NO	DESCRIPTION	APP
10.	R4	Location of Cross Passage modified.	
9.		Cross Passage Indicated.	
8.		Dead end extended.	
7.		'Y' siding introduced for reversal line.	
6.		Rail level of Chotti Chaupar and Badi Chaupar modified.	
5.	R3	UP and DN center line modified.	
4.		Alignment modified on revised topographical survey.	
3.		Center line of stations modified.	
2.	R2	Up track and down track center line introduced.	
1.	R1	Vertical alignment modified.	

DELHI METRO RAIL CORPORATION LTD.

TITLE: GENERAL ALIGNMENT DRAWING OF JAIPUR METRO

APPROVED BY:	DESIGN BY:	DRAWN BY:
SANJEEV MALIK	R.G.SHARMA	JITENDRA SINGH

DATE: 16.03.2016 REV: R4 SCALE: 0 5 10 15 20 50m

DRAWING NO.: JMRC/JP/EW1B/C1 GAD/ 2015-2016 SHEET NO. 3 of 4 SHEET SIZE:

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-II REQUIREMENTS

Section 6 – Employer's Requirements (ERQ)

Vol. III – Safety, Health and Environment (SHE) Manual

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

JAIPUR METRO RAIL CORPORATION LIMITED

SAFETY, HEALTH AND ENVIRONMENT (SHE) MANUAL

CONDITIONS OF CONTRACT ON SAFETY, HEALTH AND ENVIRONMENT

(NOVEMBER 2013)

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PART – I : SHE MANAGEMENT

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 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 JAIPUR METRO RAIL CORPORATION LIMITED (JMRC), its legal successors and assignees

vi) "Designer**"** means the Contractor, or part of the group forming the contractor, person, firm or company or group of companies, or any replacement, carrying out the Design of Works or part thereof.

vii) Chief Safety Officer means an officer nominated by JMRC who is overall responsible for monitoring all SHE functions prescribed in this document.

viii) BOCWA means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996

ix) BOCWR means Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Central Rules, 1998

x) RBOCWR means Rajasthan Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2009

xi) CIIBC means Chief Inspector of Inspection of Building and Other Construction as appointed by Govt. of Rajasthan.

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.

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 JMRC Project Safety, Health & Environment manual for best SHE performance.

1.4.3 These requirements shall be read together with JMRC Project SHE Manual, OHSAS 18001-1999, Occupational Health and Safety Management System and ISO 14001: 2004 Environmental Management Systems. Definition of key terms used in these requirements related to OHSAS 18001 and ISO 14001 standard are found in JMRC'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 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 JMRC's SHE Policy and Management Systems

3.2.1 The construction works shall be undertaken in accordance with JMRC'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, Rajasthan BOCW Rules 2009, Building and Other Construction Workers' Welfare Cess Act, 1996 and Central Rules, 1998 and Rajasthan Building Construction Workers' Welfare Board Rules, 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 Rajasthan Govt. 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, 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 including amendment made hereunder and Indian statutory requirements listed below but not limiting to:

i) The Metro Railways (Construction of Works) Act 1978 and rules made thereunder
ii) The Metro Railways (Operation and Maintenance) Act 2002 and rules made thereunder
iii) The Electricity Act 2003 and The Indian Electricity Rules 1956
iv) National Building Code, 2005
v) The Factories Act, 1948, Rajasthan Factories Rules 1951.
vi) Motor Vehicles Act as amended in 1994 and The Central Motor Vehicles Rules, 1989.
vii) Indian Road Congress Code IRC: SP: 55-2001 'Guidelines on Safety In Road Construction Zones.
viii) The Petroleum Act, 1934 and Rules 2002
ix) Gas Cylinder Rules, 2004
x) Indian Explosives Act. 1884, along with the Explosives substance Act 1908 and the Explosives Rules 1983
xi) The (Indian) Boilers Act, 1923, Rajasthan Boiler Rules, 1954
xii) The Public Liability Insurance Act 1991 and Rules 1991
xiii) Minimum Wages Act, 1948 and Rules 1950
xiv) Contract Labour Act, 1970 and Rules 1971
xv) Child Labour (Prohibitions & Regulations) Act, 1986 and Rules 1988
xvi) Environment Protection Act, 1986 and Rules 1986
xvii) Air (Prevention and control of Pollution) Act, 1981 and Rules 1982
xviii) Water (Prevention and Control of Pollution) Act, 1974 and Rules 1975
xix) The Noise Pollution (Regulation & Control) Rules, 2000
xx) Notification on Control of Noise from Diesel Generator (DG) sets, 2002
xxi) Recycled Plastic Usage Rules, 1998
xxii) Notification, Central Ground Water Board, Act January 1997
xxiii) Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989
xxiv) The Hazardous Waste (Management & Handling) Rules, 1989
xxv) Hazardous Waste Management Rules 1989 (amended 1999)
xxvi) The Bonded Labour System (Abolition) Act, 1976 and Rules 1976
xxvii) Batteries (Management and Handling) Rules, 2012
xxviii) Fly ash utilization notification, Sept 1999 as amended in August 2003

3.3.3 The Employee's Compensation Act, 1923 along with allied Rules

3.3.3.1 **The contractor shall ensure that all his employees / workmen are covered under 'Employee 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 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:

OHSAS 18001-1999 : Occupational Health and Safety Management System.
ISO 14001-2004 : Environmental Management Systems.

3.4.2 The process of certification shall start immediately after the award of the work and complete within reasonable time. 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.

3.4.3 **In case of failure on the part of the contractor, the Employer at the cost of the contractor shall do the same.**

4.0 Contractor SHE Policy and Plan

4.1 The contractor as per Section 39 of the BOCW Act shall formulate a SHE policy and get it approved by DG/CIIBC respectively and display it at conspicuous places at work sites in Hindi and a local language understood by the majority of construction workers.

4.2 Within 4 weeks of the notification of acceptance of the tender, the Contractor shall submit a detailed and comprehensive Contract specific SHE Plan. The SHE Plan shall include detailed policies, procedures and regulations which, when implemented, will ensure compliance of the contract provisions. The SHE Plan shall include the following but not be restricted to:

i) A statement of the Contractor’s policy, organisation and arrangements for SHE
ii) The name(s) and experience of person(s) within the Contractor’s proposed management who shall be responsible for co-ordinating and monitoring the Contractor’s SHE performance;
iii) The number of SHE 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 SHE 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 SHE 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 SHE related matters, and

xi) A statement of the Contractor's procedure for reporting and investigating accidents, dangerous occurrences or occupational illnesses

4.3 The Contractor shall, from time to time and as necessary are required by the Employer to produce supplements to the SHE Plan such that it is at all times a detailed, comprehensive and contemporaneous statement by the Contractor of his site safety, industrial health and environment obligations, responsibilities, policies and procedures relating to work on Site. Any and all submissions of supplements to the SHE Plan shall be made to the Employer in accordance with the agreed procedures.

4.4 If at any time the SHE plan is, in the Employer's opinion, 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 Employer may instruct the Contractor to revise the SHE plan and the Contractor shall within 7 days submit the revised plan to the Employer for review.

4.5 Any omissions, inconsistencies and errors in the SHE Plan or the Employer's acceptance or rejection of the SHE Plan 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 recognised safety practices throughout the execution of the Work.

4.6 The Contractor shall adhere to the SHE Plan 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 SHE Plan and comply with its provisions.

4.7 The details of contents to be covered in the site SHE plan are given in ***Appendix No.: 3***

5.0 Designer's role

5.0 Designer's role in Safety, Health and Environment

5.1 Designer's primary role includes to minimise the risk to health and safety of those who are going to construct, maintain, clean, repair, dismantle or demolish the structures and any one else like adjoining road users/general public, who might be affected by the work.

5.2 General philosophy

5.2.1 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, buildability 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

5.3.1 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 (eg, alter the design to avoid the risk);

ii) if this cannot be achieved, the risk should be combated at source (eg, 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 (eg, use of safety harnesses).

5.4 Duty to provide health and safety risks in the drawing itself

5.4.1 In case of situations were the designers have carried out the design work and concluded that there are risks, which was 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.

5.4.2 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

5.5.1 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 SHE personnel as prescribed in General Instruction **JMRC/SHE/GI/001** (enclosed at the end) based upon the statutory requirement and establish the safety organisation based upon the contract value. The minimum educational qualification and the work experience are given in General Instruction **JMRC/SHE/GI/002.**

6.1.2 **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 full time Labour Welfare Officer duly qualified and experienced as per Clause *6.1.1*.**

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 ***56.0*** 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.

6.3 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 Employer 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 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 **In case if the contractor fail to provide the minimum required manpower as illustrated in General Instruction JMRC/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 to provide 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 VI of RBOCWR 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 **JMRC/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 **JMRC/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 Terms of Reference

7.2.1 The Terms of Reference for the committee shall be as follows;

i) To establish company safety policies and practices

ii) To monitor the adequacy of the contractor's site SHE plan and ensure its implementation

iii) To review SHE training

iv) To review the contractor's monthly SHE report.

v) To identify probable causes of accident and unsafe practices in building or other construction work and to suggest remedial measures.

vi) 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.

vii) To go round the construction site with a view to check unsafe practices and detect unsafe conditions and to recommend remedial measures for their rectifications including first-aid medical and welfare facilities.

viii) Committee team members should perform a site inspection before every committee meetings and to monitor SHE inspection reports.

ix) 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

x) 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.

xi) 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.

xii) To review the last safety 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	SHE Manager (In-charge)
Members	i) Labour Welfare Officer ii) In charge of plant and machinery iii) In charge of site electrics iv) In charge of stores. v) Senior Managers/ Engineers heading different sub functions. vi) Sub – contractor's representative vii) Labour Contractor's representative viii) Workers' representative ix) Co-contractor representative. x) SHE staffs
Employer's Representatives	JMRC SHE 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	SHE Manager (In-charge)
Members	i) Labour Welfare Officer ii) In charge of plant and machinery iii) In-charge of site electrics iv) Senior Managers / Engineers heading different sub functions v) Sub- Contractor's representative vi) Labour contractor's representative vii) Workers' representatives viii) All SHE Staffs

7.6 Co-contractors' participation

7.6.1 In case of depot, station and other contiguous areas where more than one main contractors 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) Matters arising
x) Any other business

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/fax 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 monitory 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 **JMRC/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 JMRC/SHE/GI/005.**

8.3 Contractor shall also issue a 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.

9.0 SHE Training

9.1 The behaviour of people at all levels of the contractor is critical for SHE performance.

9.2 The contractor shall organise quality SHE training to engage Managers, supervisors and other personnel in behavioural change and improve safety performance.

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 SHE responsibilities
ii) Specification of qualifications, competency and training requirements for all personnel
iii) Assessment and recording of training needs for all personnel, including subcontractors' employees in the workforce, vendor representatives and site visitors
iv) A system for assessing new hirers e.g. previous training
v) A means of confirming that the system is effective
vi) A matrix and schedule of training requirements, covering general, task–specific and SHE-related training, showing the training frequency and interval between refresher courses
vii) 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 **JMRC/SHE/GI/006**

9.6 The contents of SHE training to Managers/Supervisors as given in general instruction **JMRC/SHE/GI/007** shall be conducted.

9.7 **The refresher-training programme to all employees shall be conducted once in six months.**

9.8 **Toolbox talk as given in the Employer's Project SHE manual shall be conducted to all high-risk workmen everyday.**

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 **Daily Safety Oath as given in Project SHE manual shall be taken by every employee including workman without fail.**

9.11 **All vehicle drivers including Hydra operators shall be trained on defensive driving at any Government authorized Institute or Maruti Institute of Driver Training and Research at Wazirabad Road, Adjoining Loni Road Flyover, Delhi-110094. All vehicle drivers shall also undergo refresher training on defensive driving provided by the same institute once in 6 months.**

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 Employer 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.**

10.0 SHE Inspection

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 inspections 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 subcontractors site safety committee Inspection.
ii) Weekly safety inspection by construction supervisors (Contractors and Sub-contractors).

iii) Daily safety inspection by contractor site SHE 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) 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.

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 includes the following:

i) Mandatory Inspections by Labour Department of Government.

ii) JMRC site SHE management team

10.3.5 The contractor shall prepare all required safety inspection checklist for all activity operations and equipment. Checklists will be prepared based on the Indian standards, rules and regulations and Employer's requirements. The formats provided in the Project SHE manual may be referred.

10.3.6 All inspection records and reports will be properly kept and filed for audit purpose. Inspection reports of Planned General Inspection and Routine Inspection will be used for discussion during Safety Committee Meetings.

11.0 SHE Audit

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 legislation 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 (M A R S)

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 JMRC 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:

$$\text{Overall Audit rating} = \frac{\text{Actual Score Achieved}}{\text{Maximum Possible Score}} \times 100$$

11.2.5.2 The criticality of the required actions for the respective sections of the Audit will be classified as:

Sl. No.	Score	Description	Action
1	< 60%	Immediate	Require Contractor to rectify within 24 hours and confirm in writing to Employer
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 SHE 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 SHE Audit

11.4.1 **External SHE audits are to be conducted by external agencies that are competent with ISO qualified auditors 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 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 SHE audit shall be conducted on a quarterly basis throughout the currency of the contract.**

11.4.4 Targets of SHE Audit:

The contents and coverage of the external audit shall include the following items

11.4.4.1 SHE management:

i) Organization
ii) Communication and Motivation
iii) Time office
iv) Inspection
v) Emergency preparedness
vi) Budget allocation
vii) Education and Training
viii) Work permit system

11.4.4.2 Technical:

i) Building and Structure
ii) Construction operational safety
iii) Material safety
iv) Hand tools and Power tools
v) Electrical system
vi) Safety Appliances
vii) Fire prevention and control
viii) Housekeeping
ix) Maintenance and Machinery safety
x) First-aid and Medical Facilities
xi) Welfare measures
xii) Environmental Management

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) SHE policy
ii) SHE manual
iii) SHE Rules and Regulation
iv) SHE organization chart
v) Annual SHE objectives / programs
vi) Accident / near miss statistics and analysis
vii) SHE Training program / records for all personnel
viii) Operating manuals and maintenance manual of all equipments
ix) Safe worthiness certificates of all lifting appliances and gears
x) Medical fitness record for all personnel
xi) Risk identification, assessment and control details
xii) Environmental management reports
xiii) Emergency management records including mock drill

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 JMRC 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 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.

11.4.9 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.

11.4.10 Failure of contractor to conduct External SHE Audit

11.4.10.1 **If the contractor fails to conduct the external SHE audit in time, the Employer at the cost of contractor shall get it done.**

12.0 SHE Communication

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 **JMRC/SHE/GI/008** and printing and displaying safety signage and posters as listed in General Instruction **JMRC/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 no of workmen (as given in Clause **13.2**)
ii) Monthly SHE Report (as given in Clause **13.3**)
iii) SHE Committee Meeting Minutes (as given in Clause ***7.9.1***)
iv) SHE Inspection Reports
v) SHE Audit Reports
   a) Monthly Audit Rating Score (MARS) report
   b) External SHE Audit
   c) Electrical Safety Audit
vi) Air and Noise Quality monitoring report

13.2 Daily Reporting of total no of workmen

13.2.1 **The contractor shall report to the Employer the total no 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 report consisting of the following and submit 3 copies within 7th of next month to the Employer as specified in the Project SHE manual.

i) Monthly man-hour details as specified in the Project SHE manual
ii) Monthly accident / incident details as specified in the Project SHE manual
iii) SHE committee details

iv) Details of SHE training conducted in the month
v) SHE Inspection
vi) SHE internal audit details like electrical audit etc.
vii) SHE Communication activities under taken in the month indicating the number of posters displayed and balance availability in stock.
viii) Air quality / Noise monitoring details
ix) Toolbox talks details
x) PPE details: Quantity purchased, issued to the workmen and stock available.
xi) Details on IP 44 panel boards, lighting poles, welding and cutting equipments, Ladders, Hoists, tools & tackles.
xii) Monthly Lux meter study results
xiii) Housekeeping
xiv) Barricade maintenance details
xv) No of critical excavations
xvi) Health & Welfare activities
xvii) Safety walk conducted by Contractors' Project Manager in the month
xviii) SHE Activities Planned for next month

14.0 **Accident reporting and investigation**

14.1 Reporting to Employer

14.1.1 **All accidents 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 format provided in the Employer's Project SHE manual.**

14.1.3 **No accident / dangerous occurrences is 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.**

14.2 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:

a) causes loss of life; or
b) disables a worker from working for a period of 48 hours or more immediately following the accident;
c) 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:
    i) the Regional Labour Commissioner (central), wherein the contractor has registered the firm/work
    ii) the board with which the worker involved was registered as a beneficiary;

iii) Director General and

iv) 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

(a) causes loss of life; or

(b) disables the injured worker from work for more than 10 days to

i) the officer-in-charge of the nearest police station;

ii) the District Magistrate or, if the District Magistrate by order so desires, to

iii) 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.

14.3.2 Procedure of incident investigation

14.3.2.1 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, workpiece 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.

14.3.2.2 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.

14.3.2.3 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 with out 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 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 JMRC, telephonically initially and followed by a written report, shall be made by the contractor.

16.0 Experts / Agencies for SHE services

16.1 Contractors may utilise the services of experts/agencies empanelled under Rule 250 of BOCWR and Rule 277 of RBOCWR for the purpose of training, internal audit and any other SHE services with prior approval of the Employer.

16.2 As an aide to contractors, a list of experts/agencies and the offered service are given in General Instruction **JMRC/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 house keeping 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 House keeping 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 house keeping personnel as per General Instruction **JMRC/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. This shall be carried out by team of housekeeping squad.

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, JMRC 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 either bent / 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.

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

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 be able to 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 -

(a) 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
(b) rope access and positioning techniques;

18.1.5 "work at height" means -

(a) work in any place, including a place at or below ground level;
(b) 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

(a) a guard-rail, toe-board, barrier or similar collective means of protection

(b) a working platform
(c) a net, airbag or other collective safe guard for arresting falls.
(d) personal fall protection system
(e) ladders

18.1.7 "working platform"

(a) means any platform used as a place of work or as a means of access to or egress from a place of work;
(b) 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.

(a) his ensuring that the work is carried out
    (i) from an existing place of work; or
    (ii) (in the case of obtaining access or egress) using an existing means, complying to the requirements as given in ***18.15***

    where it is reasonably practicable to carry it out safely and under appropriate ergonomic conditions; and

(b) 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

(a) so far as is reasonably practicable, provide sufficient work equipment to minimise -
    (i) the distance and consequences; or
    (ii) where it is not reasonably practicable to minimise the distance, the consequences, of a fall; and

(b) 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

1) 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
      i) the working conditions and the risks to the safety of persons at the place where the work equipment is to be used;
      ii) in the case of work equipment for access and egress, the distance to be negotiated;
      iii) the distance and consequences of a potential fall;
      iv) the duration and frequency of use;
      v) the need for easy and timely evacuation and rescue in an emergency; and
      vi) any additional risk posed by the use, installation or removal of that work equipment or by evacuation and rescue from it;

(2) The contractor shall select work equipment for work at height which:

   a) has characteristics including dimensions which:
      (i) are appropriate to the nature of the work to be performed and the foreseeable loadings; and
      (ii) allow passage without risk; and
   b) is in other respects the most suitable work equipment, having regard in particular to the purposes specified in ***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,

(a) 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;

(b) 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

(a) prominent warning notices are so far as is reasonably practicable affixed at the approach to the place where the fragile surface is situated; or

(b) 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, where necessary to prevent injury to any person, 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 ***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.

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.

18.10.4 Every employer 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

(a) where a workplace contains an area in which, owing to the nature of the work, there is a risk of any person at work

i) falling a distance; or

ii) 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

(b) 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

(a) at suitable intervals; and

(b) 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 paragraph ***18.12.1***, the contractor shall ensure that a working platform

(a) used for construction work; and

(b) 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",

(a) means such visual or more rigorous inspection by a competent person as is appropriate for safety purposes;

(b) includes any testing appropriate for those purposes,

18.13 Inspection of places of work at height

18.13.1 The contractor shall so far as is 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 workmen shall use any work equipment or safety device provided to him for work at height by the contractor, in accordance with

(a) any training in the use of the work equipment or device concerned which have been received by him; and

(b) 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

(a) be stable and of sufficient strength and rigidity for the purpose for which it is intended to be or is being used;

(b) where applicable, rest on a stable, sufficiently strong surface;

(c) 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;

(d) possess suitable and sufficient means for preventing a fall;

(e) possess a surface which has no gap

(i) through which a person could fall;

(ii) through which any material or object could fall and injure a person; or

(iii) giving rise to other risk of injury to any person, unless measures have been taken to protect persons against such risk;

(f) be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable -

(i) the risk of slipping or tripping; or

(ii) any person being caught between it and any adjacent structure;

(g) 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 platforms 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

i) through which a person could fall;

ii) through which any material or object could fall and injure a person; or

iii) 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

i) the risk of slipping or tripping; or

ii) 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 are 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

(i) the work can so far as is reasonably practicable be performed safely while using that system; and

(ii) 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.

18.20 Requirements for Ladders

1) 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

i) The short duration of use; or

ii) Existing features on site, which he cannot alter.

2) Only metal ladders shall be allowed. Bamboo ladders are prohibited.

3) 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.

4) A ladder shall be so positioned as to ensure its stability during use

5) 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.

6) A portable ladder shall be prevented from slipping during use by -

i) securing the stiles at or near their upper or lower ends;

ii) an effective anti-slip or other effective stability device; or

iii) any other arrangement of equivalent effectiveness.

7) 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.

8) No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.

9) A mobile ladder shall be prevented from moving before it is stepped on.

10) 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.

11) 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

(i) the low risk; and

(ii) the short duration of use.

19.0 Overhead protection

All contractors shall provide overhead protections as per Rule 41 of BOCWR

i) 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.

ii) 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 20^0 to its horizontal sloping into the building.

iii) Overhead protection shall not be erected more than a height of 5m from the base of the building.

iv) 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,

i) All places should be free from dust, debris or similar materials.

ii) 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.

iii) 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.

iv) 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.

v) 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.

vi) Suitable safety net shall be provided at places of material / man falling is possible in accordance with national standards.

21.0 Lifting Appliances and Gear

21.1 (a) Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, loffing 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.

(b) Use of "Tractor Transmission Type "Pick and Carry Hydra crane

"Tractor Transmission Type "Pick and Carry Hydra crane – 1st Generation model is prohibited at JMRC works. Contractor shall mobilize 'Truck Transmission Type' pick and hydra crane – 2nd Generation model only

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 radii 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
iii) the number and frequency of lifts to be made
iv) how long the crane will be required on site
v) the type of lifting to be done (for example, is precision placement of loads important?
vi) 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 th e front
vii) whether loads will have to be walked or carried
viii) whether loads will have to be suspended for lengthy periods
ix) 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

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 Employers 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 (SLI), 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 Rule 100 of RBOCW Rules, every 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

21.10.1.1 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

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 at 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.**

21.12 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 job, 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) Drivers engaged for driving these trucks, shall be trained once in 6 months on defensive driving at any Government authorized Institute or Maruti Institute of Driver Training and Research at Wazirabad Road, Adjoining Loni Road Flyover, Delhi-110094.

viii) Drivers shall also have undergone proper medical examination as per relevant clause mentioned under 'Medical Facilities'.

ix) The segments shall 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.

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 bowsers, 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

23.3.1 **All Vehicles shall be fitted with audible reverse alarms and maintained in good working condition. Reversing shall be done only when there is adequate rear view visibility or under the directions of a banksman.**

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 banksman 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 180^0 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) Incase 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 Penalty

23.6.1 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 **JMRC/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**

26.3.1 **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

26.4.1 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

26.5.1 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,

i) Fixed plant – 400V 3 phase
ii) Movable plant fed via trailing cable over 3.75 kW – 400 3 phase
iii) Installation in site buildings – 230V single phase
iv) Fixed flood lighting – 230V single phase
v) Portable and hand tools – 115V single phase
vi) Site lighting - 115V single phase
vii) 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^2 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 under ground 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 6 m 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:

(a) 110 volts : Yellow.

(b) 240 volts : Blue.

(c) 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 any where 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:

26.11.1 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

26.13.1 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:

Type of Lighting	Area of Requirement	Luminaries
Area Lighting	Workmen and vehicles to move about in safely.	i) Shovel type: non-symmetrical ii) Symmetrical or non-symmetrical tungsten halogen

Beam flood lighting	Concentrated light over an area from a relatively great distance.	i) Portable flood light (Conical beam) ii) Wide angle flood (fan shaped beam) iii) Medium or narrow angle flood (Conical beam)
Dispersive lighting	Lighting for indoor	i) Dispersive (Mercury florescent) ii) Cargo cluster iii) Florescent trough
Walkway lighting	Lighting for stairways, ladder ways, corridors, scaffold access routs, etc.	i) Well glass unit ii) Bulkhead unit (tungsten filament) iii) Bulk head unit (Florescent)
Local lighting	Lighting on sites and fittings are generally accessible to operatives	i) PAR (Parabolic Aluminised Reflector) lamp cluster ii) Festoons (with or without shades) iii) Adjustable florescent work lamp iv) 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 luminaries should always be used and when lamps need to be replaced if 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 **JMRC/SHE/GI/0011**.

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,

i) 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.

ii) Mushroom headed chisels shall not be used in the worksite where the fragments of the head may cause injury.

iii) Unless hatchet has a striking face, it shall be used as a hammer.

iv) Only knives of retractable blades shall be used in the worksite.

v) No screwdrivers shall be used for scraping, chiselling or punching holes.

vi) A pilot hole shall always be driven before driving a screw.

vii) 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 contract 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 need 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 n 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 180^0 of the wheel 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 moves 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 CO_2 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, 1.6 meters (5 feet) high partition. Flammable substances shall not be stored within 50 feet 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.

30.0 Dangerous and harmful environment

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.

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 give consideration to 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 RBOCW Rules 2009, Rule 106(a)(vii), 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

32.1 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 life 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.

34.0 Excavation and Tunnelling:

34.1 Excavation

34.1.1 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 is 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 maintained 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 under ground 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 of 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^3/ min for each worker employed in tunnel as per Rule 153 of BOCWR.

34.3 Warning signs and notices:

34.3.1 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

36.7.1 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 **JMRC/SHE/GI/012** shall be installed an 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 channelising 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 to 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 channelising 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

36.9.4.1 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.

36.9.4.2 The structure dimension of the barricade, material and composition, its colour scheme, JMRC logo and other details shall be in accordance with specifications laid down in tender document.

36.9.4.3 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.

36.9.4.4 **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**

36.9.7.1 **The contractor shall make arrangements keeping toe away van / manpower to tow away any breakdown vehicle in the traffic flow without loosing any time at his cost.**

36.9.8 **Cleaning of roads**

36.9.8.1 **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.**

37.0 Work to adjacent 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:

(a) The rules provided for in the Railway's manual shall be followed.

(b) No persons are allowed to encroach onto the railway unless specific authority has been given by the owner.

(c) Adequate protection in accordance with the railway owner's requirements shall be followed. (Provision of Block Inspectors, Flagmen and Lookouts)

(d) All persons shall wear high visibility clothing at all times.

(e) Any induction training requirements of the railways shall be strictly observed

38.0 Batching Plant / Casting Yard

i) 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.

ii) The batching plant / casting yard shall be barricaded and made as a compulsory PPE zone

iii) 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.

iv) 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.

v) Drainage shall be effectively provided and waste water shall be disposed after proper treatment

vi) 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.

vii) 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.

viii) The PPEs provided to cement handling workmen shall conform to international standards.

ix) Access roads and internal circulation roads shall be well laid and maintained properly at all time.

x) Non-adherence to any of the above provision shall be penalised as per relevant penalty clause.

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
i) Hard hat with company Logo ii) Safety boots iii) Hi-visibility **waistcoat** covering upper body and meeting the following requirements as per BS EN 471:1994: a) Background in fluorescent orange-red in colour b) Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm^2 c) Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm^2 d) Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. e) The bottom strip shall be at a distance of 5cm from the bottom of the vest. f) Strips must be retro reflective and fluorescent g) Waistcoat shall have a side adjustable fit and a side and front tear-away feature on vests made of nylon.	i) Hard hat with reflective tape ii) Safety boots iii) Hi-visibility **jacket** covering upper body and meeting the following requirements as per BS EN 471:1994 : a) Background in fluorescent orange-red in colour b) 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. c) Two vertical green strips of 5cm wide on front side, covering the torso at least 500 cm^2 d) Two diagonal strips of 5 cm wide on back in an 'X' pattern covering at least 570cm^2 e) Horizontal strips not less than 5cm wide running around the bottom of the vertical strip in front and 'X' pattern at back. f) The bottom strip shall be at a distance of 5cm from the bottom of the vest. g) Strips must be retro reflective and fluorescent.

39.4.1 Colour coding for helmets

Safety Helmet Colour Code (Every Helmet should have the LOGO* affixed /painted)	Person to use
White	JMRC 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-contactor)
Orange	Security Guards / Traffic marshals
Yellow	All workmen

White (with "VISITOR" sticker)	Visitors

Note: LOGO*

1. Logo shall have its outer dimension 2"X2" and shall be conspicuous
2. Logo shall be either painted or affixed
3. 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.

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..

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**

42.2.1 **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 possesses the qualification as laid down in Schedule XI of BOCWR.**

42.3 **Ambulance van and room**

42.3.1 **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

42.4.1 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 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) Still waters shall be treated at least once every week with oil in order to prevent mosquito breeding.

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 both 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 Govt. regulations.

42.7.2 Smoking at public worksites by any employee is also prohibited as per Govt. regulations.

43.0 Noise

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:

i) 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.

ii) 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, as given in the project SHE Manual. 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.

43.1.3 The noise monitoring requirements including monitoring locations are given in the project SHE Manual.

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 as provided in Project SHE Manual.

ii) When employees are subjected to sound levels exceeding those listed in the Table, feasible administrative or engineering controls should be utilized as given in this document and JMRC's Project SHE Manual.

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 as given in project SHE Manual.

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 as given in article project SHE Manual.

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 $6m^3$/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 **JMRC/SHE/GI/0011**.

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 Govt. 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 Employer's 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 Govt. Enactments.

45.5 The contractor shall ensure that all site personnel and members of the public are not exposed to radiation.

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

46.1.4.1 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 like "Sulabh" at the cost of the contractor.**

46.2 **Canteen**:

46.2.1 **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:**

46.3.1 **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.**

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 on Public Health.**

46.4.2 While locating these drinking water facility 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**

46.5.1 **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

46.6.1 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.

PART – IV : ENVIRONMENTAL MANAGEMENT

47.0 Air Quality

47.1 The Contractor shall take all necessary precautions to minimise fugitive dust emissions from operations involving excavation, grading, and clearing of land and disposal of waste. He shall not allow emissions of fugitive dust from any transport, handling, construction or storage activity to remain visible in atmosphere beyond the property line of emission source for any prolonged period of time without notification to the Employer.

47.2 The Contractor shall use construction equipment designed and equipped to minimise or control air pollution. He shall maintain evidence of such design and equipment and make these available for inspection by Employer.

47.3 If after commencement of construction activity, Employer believes that the Contractor's equipment or methods of working are causing unacceptable air pollution impacts then these shall be inspected and remedial proposals shall be drawn up by the Contractor, submitted for review to the Employer and implemented.

47.4 In developing these remedial measures, the Contractor shall inspect and review all dust sources that may be contributing to air pollution. Remedial measures include use of additional/ alternative equipment by the Contractor or maintenance/modification of existing equipment of the Contractor.

In the event that approved remedial measures are not being implemented and serious impacts persist, the Employer may direct the Contractor to suspend work until the measures are implemented, as required under the Contract.

47.5 Contractor's transport vehicles and other equipment 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 measures including replacement, if required, so as to operate within permissible norms.

47.6 The Contractor shall establish and maintain records of routine maintenance program for internal combustion engine powered vehicles and equipment used on this project. He shall keep records available for inspection by Employer.

47.7 The Contractor shall cover loads of dust generating materials like debris and soil being transported from construction sites. All trucks carrying loose material should be covered and loaded with sufficient free- board to avoid spills through the tail board or side boards.

47.8 The Contractor shall promptly transport all excavation disposal materials of whatever kind so as not to delay work on the project. Stockpiling of materials will only be allowed at sites designated by the Employer. The Contractor shall place excavation materials in the dumping/disposal areas designated in the plans as given in the specifications.

47.9 The temporary dumping areas shall be maintained by the Contractor at all times until the excavate is re-utilised for backfilling or as directed by Employer. Dust control activities shall continue even during any work stoppage.

47.10 The Contractor shall place material in a manner that will minimize dust production. Material shall be minimized each day and wetted, to minimize dust production. During dry weather, dust control methods must be used daily especially on windy, dry days to prevent any dust from blowing across the site perimeter.

47.11 The Contractor shall water down construction sites as required to suppress dust, during handling of excavation soil or debris or during demolition. The Contractor will make water sprinklers, water supply and water delivering equipment available at any time that it is required for dust control use. Dust screens will be used, as feasible when additional dust control measures are needed specially where the work is near sensitive receptors.

47.12 The Contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from work sites such as construction depots and batching plants. At such facility, high-pressure water jets will be directed at the wheels of vehicles to remove all spoil and dirt.

47.13 The Contractor shall design and implement his blasting techniques so as to minimise dust, noise, vibration generation and prevention fly rock.

47.14 Blasting technique should be consistent not only with nature and quaintly of rock to be blasted but also the location of blasting.

47.15 The contractor shall give preference to explosives with better environmental characteristics.

47.16 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.

47.17 The Contractor shall submit to the Employer an Air Monitoring and Control Plan (AMCP) under contract specific Site Environmental Plan to guide construction activity insofar as it relates to monitoring, controlling and mitigating air pollution.

48.0 Water Quality

48.1 The Contractor shall comply with the Indian Government legislation and other State regulations in existence in Jaipur insofar as they relate to water pollution control and monitoring. A drainage system should be constructed at the commencement of the Works, to drain off all surface water from the work site into suitable drain outlet.

48.2 The Contractor shall provide adequate precautions to ensure that no spoil 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 and drains within or adjacent to the site. In the event of any spoil or debris from construction works being deposited or any silt washed down to any area, then all such spoil, 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.

48.3 Due to lowering of potable water supplies in Jaipur and subsequent contamination of ground water, 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 and this water may subsequently be discharged to the drainage system or, if not re-used, recharged to the ground water at suitable aquifer levels. The Contractor must submit his proposals for approval of Employer, on his proposed locations of dewatering of excavation and collection of water for either construction re-use or recharge directly to

aquifers. The Contractor's recharge proposals must be sufficient for recharging of the quantity of water remaining after deduction of water re-used for construction. During dewatering, the contractor shall monitor ground water levels from wells to ensure that draw down levels do not exceed allowable limits. The Contractor will not be permitted to directly discharge, to the drainage system, unused ground water obtaining from the excavation without obtaining approval of Employer or the Agency controlling the system.

48.4 The Contractor shall ensure that earth, bentonite, chemicals and concrete agitator washings etc. are not deposited in the watercourses but are suitably collected and residue disposed off in a manner approved by local authorities.

48.5 All water and waste products (surface runoff and wastewater) arising on the site shall be collected and removed from the site via a suitable and properly designed temporary drainage system and disposed off at a location and in a manner that will cause neither pollution nor nuisance.

48.6 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, bentonite etc. The Contractor shall provide treatment facilities as necessary to prevent the discharge of contaminated ground water.

48.7 The Contractor shall discharge wastewater arising out of site office, canteen or toilet facilities constructed by him into sewers after obtaining prior approval of agency controlling the system. A wastewater drainage system shall be provided to drain wastewater into the sewerage system.

48.8 The bentonite mixing, treatment and handling system shall be established by the contractor giving due regard to its environmental impacts. The disposal of redundant bentonite shall be carefully considered whether in bulk or liquid form. The disposal location will be advised and agreed with the relevant authorities.

48.9 The Contractor shall take measures to prevent discharge of oil and grease during spillage from reaching drainage system or any water body. Oil removal / interceptors shall be provided to treat oil waste from workshop areas etc.

48.10 The Contractor shall apply to the appropriate authority for installing bore wells for water supply at site.

49.0 Archaeological and Historical Preservation

49.1 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.

49.2 The contractor shall consult the Archaeological Survey of India (ASI). Other competent authorities and other parties, on the advise of the Employer, to identify and assess construction effects and seek ways to avoid, minimize or mitigate adverse effects on such monuments.

49.3 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.

50.0 Landscape and Greenery

50.1 As far as is reasonably practicable, the Contractor shall maintain ecological balance by preventing deforestation and defacing of natural landscape. In respect of ecological balance, the Contractor shall observe the following instructions.

50.2 The Contractor shall, so conduct his construction operations, as to prevent any avoidable destruction, scarring or defacing of natural surrounding in the vicinity of work.

50.3 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.

50.4 A suggested list of trees/shrubs suitable for planting and landscaping is found in Employer's Project SHE Manual.

51.0 Felling of Trees

51.1 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 Jaipur Metro Project and inform the Employer.

51.2 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 Jaiur Metro except with the previous permission obtained from the Forest Department.

51.3 The Employer shall arrange permission from the forest department for trees to be felled or transplanted. The Employer will permit the removal of trees or shrubs only after prior approval.

51.4 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 used of protective barriers or other methods approved by the Employer. Trees shall not be used for anchorage.

52.0 Fly Ash

52.1 The Employer may require the contractor to use fly ash as a percentage substitution of cement, in concrete for certain structures and works.

52.2 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.

52.3 The reporting details on consumption of Fly Ash are found in Employer's SHE Manual.

53.0 Waste

53.1 The contractor is required to develop, institute and maintain a Waste Management Programme (WMP) during the construction of the project for his works, which may include: -

i) Identification of disposal sites.
ii) Identification of quantities to be excavated and disposed off.
iii) Identification of split between waste and inert material
iv) Identification of amounts intended to be stored temporarily on site location of such storage.
v) Identification of intended transport means and route.
vi) Obtaining permission, where required, for disposal.

53.2 Such a mechanism is intended to ensure that the designation of areas for the segregation and temporary storage of reusable and recyclable materials are incorporate into the WMP. The WMP should be prepared and submitted to the Engineer for approval.

53.3 The Contractor shall handle waste in a manner that ensures they are held securely without loss or leakage thus minimizing potential for pollution. The Contractor shall maintain and clean waste storage areas regularly.

53.4 The Contractor shall remove waste in a timely manner and disposed off at landfill sites after obtaining approval of Jaipur Municipal Corporation for its disposal.

53.5 Burning of wastes is prohibited. The Contractor shall not burn debris or vegetation or construction waste on the site but remove it in accordance with ***50.1*** above.

53.6 The Contractor shall make arrangement to dispose of metal scrap and other saleable waste to authorized dealer and make available to the Employer on request, records of such sales.

54.0 Hazardous Waste Management

54.1 If encountered or generated as a result of Contractor's activity, then waste classified as hazardous under the "Hazardous Wastes (Management & Handling) Rules, 1989, amendments 2000, 2003" shall be disposed off in a manner in compliance with the procedure given in the rules under the aforesaid act.

54.2 Chemicals classified as hazardous chemicals under "Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 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.

54.3 The contractor shall identify the nature and quantity of hazardous waste generated as a result of his activities and shall file a 'Request for Authorisation' with Rajasthan State Pollution Control Board along with a map showing the location of storage area.

54.4 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

54.5 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.

54.6 The contractor shall approach only Authorised Recyclers of Hazardous Waste for disposal of Hazardous Waste, under intimation to the Employer.

54.7 Submittal of all environment related documents and records pertaining to monitoring and trend analysis on key parameters such as but not limited to consumption/efficient use of resources such as energy, water, material such as cement, fly ash, iron and steel, recycle/reuse of waste etc that shall have demonstrated continual improvement in the implementation of Environmental management System. Failure to do so the employer shall impose appropriate penalty as indicated under penalty clause.

55.0 Energy Management

55.1 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.

55.2 Measures to conserve energy include but not limited to the following:

i) Use of energy efficient motors and pumps
ii) Use of energy efficient lighting, which uses energy efficient luminaries
iii) Adequate and uniform illumination level at construction sites suitable for the task
iv) Proper size and length of cables and wires to match the rating of equipment
v) Use of energy efficient air conditioners

55.3 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.

PART – V : PENALTY AND AWARDS

56.0 Charges to be recovered from contractor for unsafe act or condition

56.1 JMRC has built an image of safety conscious organisation meticulously over a period of three years. Any reportable accident (fatality / injury) results in loss of life and/or property damage. These accidents not only result in loss of life but also damage the reputation of JMRC. Most of the accidents are avoidable and caused preliminary due to contractors' negligence. Hence JMRC shall recover the cost of damages from the contractors for every reportable incident (fatality / injury).

56.2 In addition every JMRC work site is exposed to public scrutiny as the work is executed just on the right-of-way. Any unsafe act / unsafe condition observed by public further damages our reputation. Because of the non-voluntary compliance of contractors to the condition of contract on SHE and project SHE manual, JMRC has been forced to establish safety-enforcing organisation. The cost of established such organisation is to be recovered from contractors for all observed safety violations at sites.

56.3 The following table indicates the Safety, Health and Environment violation (unsafe act / unsafe condition) and charges to be recovered from contractors.

SL. NO.	TOPIC	UNSAFE ACT/UNSAFE CONDITION	DEDUCTIBLE AMOUNT
1.	SHE Policy & Plan	i) SHE policy a) non-compliance of clause 4.1 b) Inadequate coverage, not signed c) Not displayed at prominent locations	Rs.5,000 per single violation, compounded to a maximum of Rs.25,000 at any single instance.
		ii) SHE plan: a) Not as per Employers' content and coverage b) Delay in submission c) Not updated as per employer's instruction as per clause 4.4 d) Copies not provided to all required supervisors / engineers	Rs.1,00,000 per single violation, compounded to a maximum of Rs.2,00,000 at any single instance.
2.	SHE Organisation	i) Not complying to the minimum manpower requirements as mentioned in General Instruction JMRC/SHE/001 ii) Not filling up the vacancies created due to SHE personnel leaving the contractor within 14 days. iii) SHE organisation not provided with required Audio-visual and other equipments as per General Instruction JMRC/SHE/012 iv) Employing through outsourcing	i) Rs.1,00,000 per month for first month and Rs.2,00,000 for subsequent months ii) Rs.50,000 per month for first month and Rs.1,00,000 for subsequent months For items iii), iv), v) and vi) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations

		agencies and SHE personal are not in the payroll of the main contractor v) Disobedience / Improper conduct of any SHE personnel. vi) Chief SHE Manager not reporting directly to CPM of contractor.	
3.	SHE committee	i) Failed to formulate or conduct SHE Committee meeting for any month ii) Contractor and Sub-contractor representatives not attending SHE Committee meetings iii) Failed to conduct Site inspection before conducting SHE Committee meeting iv) Failed to send SHE Committee Meeting minutes or Agenda to Employer in time v) Non-adherence of clause 7.7.1 vi) Non-adherence of clause 7.9	i) Rs.1,00,000 for the first violation and Rs.5,00,000 for the subsequent violations ii) 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. For item iii), iv), v) and vi) Rs.25,000 for first violation and Rs.50,000 for subsequent violations
4.	ID card	i) Non-adherence of clause 8.1, 8.2 and 8.3	Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations
5.	SHE Training	i) 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 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 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 9.10 g) Top management behaviour based SHE training conducted	For item 1 a) to g) Rs.50,000 for first violation on and Rs.1,00,000 for subsequent violations
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 ii) Non compliance of clause 10.3.6	Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations
7.	SHE audit	Internal Audit: MARS i) Not conducted as per SHE Plan ii) Report not sent to Employer iii) Action not taken for any month	For item i) to iii) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations.

		External Audit iv) Not conducted as per SHE Plan v) Report not sent to employer vi) Action not taken for any quarter	For item iv) to vi) Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations.
8.	SHE Communication	i) Important days to be observed for SHE awareness as furnished by employer not observed ii) Posters as furnished by Employer not printed and displayed	i) Rs.10,000 for first violation and Rs.50,000 for subsequent violations ii) 2,00,000 per contract
9.	SHE Submittals	i) Non compliance of clause 13.1 ii) Non compliance of clause 13.2 iii) Non compliance of clause 13.3	For item i) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations For item ii) and iii) Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations
10.	Injury and Incidence reporting	i) Fatal accidents ii) Injury accident iii) Abnormal delay in reporting accidents or wilful suppression of information about any accidents / dangerous occurrence as per clause 14.1.4 iv) Delay in informing about any accidents / dangerous incidents. v) Non-compliance of the clause 14.4	i. Rs.5,00,000 for first fatality and Rs.10,00,000 for every subsequent fatality. ii. Rs.1,00,000 for first grievously injured person and Rs.2,00,000 for every subsequent grievously injured person (Grievous Injury as defined by Workmen Compensation Act) iii. Rs.1,00,000 for first violation and Rs.2,00,000 for subsequent violations For items iv) and v) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations
11.	Emergency preparedness Plan	Non-compliance of the clause 15.1,15.2, 15.3, 15.4, 15.5 and 15.6	Rs.1,00,000 for non-compliance of any of the clauses
12.	Housekeeping	i) Housekeeping maintenance register not properly maintained up to date ii) Surrounding areas of drinking water tanks / taps not hygienically cleaned / maintained iii) Office, stores, toilet / urinals not properly cleaned and maintained. iv) Required dustbins at appropriate places not provided / not cleaned. v) Stairways, gangways, passageways blocked.	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance

		vi) Lumber with protruding nails left as such vii) Openings unprotected viii) Excavated earth not removed within a reasonable time. ix) Truck carrying excavated earth not covered / tyres not cleaned. x) Vehicles / equipments parked / placed on roads obstructing free flow of traffic xi) Unused surplus cables / steel scraps lying scattered xii) Wooden scraps, empty wooden cable drums lying scattered xiii) Water stagnation leading to mosquito breeding	
13.	Working at Height / Ladders and Scaffolds	i) Not using or anchoring Safety Belt ii) Not using Safety Net iii) Absence of life line or anchorage point to anchor safety belt iv) Non-compliance of clause 18.17 v) Using Bamboo ladders vi) Painting of ladders vii) Improper usage (less than 1m extension above landing point, not maintaining 1:4 ratio) viii) Aluminium ladders without base rubber bush ix) Usage of broken / week ladders x) Usage of re-bar welded ladders xi) Improper guardrail, toe board, barriers and other means of collective protection xii) Improper working platform xiii) Working at unprotected fragile surface xiv) Working at unprotected edges	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
14.	Lifting appliances and gear	i) Non availability of fitness certificate as per clause 21.3 ii) Documents not displayed on the machine or not available with the operator as per clause 21.4 iii) Maximum Safe Working Load not written on the machine as per clause 21.5 iv) Non-compliance of 21.6 v) Non-compliance of 21.7 vi) Automatic safe load indicator not provided or not in working condition as per clause 21.8 vii) Age of the operator less than 21 years or without any licence and non-compliance of other item as per clause 21.9	Rs.50,000 per single violation Compounded to a maximum of Rs.5,00,000 at any single instance

		viii) Non-compliance of 21.10 ix) Non-compliance of any of the items mentioned regarding rigging requirements as per clause 21.11 x) Failure to submit method statement in case of all critical lifting xi) Person riding on crane. xii) Creating more noise and smoke xiii) Absence of portable fire extinguisher in driver cabin xiv) Fail to guard hoist platform xv) No fencing of hoist rope movement area xvi) Hoist platform not in the horizontal position	
15.	Launching operation	Non-adherence of any of the provisions mentioned in clause 22.2	Rs. 50,000 for first violation and Rs.1,00,000 for subsequent violations .
16.	Site Electrical safety	i) Non-compliance of clause 26.1.1 ii) Non-compliance of clause 26.2.4, 26.2.5 iii) Non-compliance of clause 26.3.1 iv) Non-compliance of clause 26.7, 26.8 and 26.9.1 v) Non-compliance of clause 26.10 and 26.13 vi) Non-compliance of clause 28.3.2 vii) Exposed electric lines (fermentative damage) and circuits in the workplace. viii) Inserting of bare wires into the socket ix) Improper grounding for the electrical appliances x) Electrical cables running on the ground xi) Non-compliance clause 27.0	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
17.	Hand tools and Power tools	i) Non-compliance of clause 28.0	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
18.	Gas Cutting	ii) Wrong colour coding of cylinder. iii) Cylinders not stored in upright position. iv) Flash back arrester, non-return valve and regulator not present or not in working condition. v) Fail to put cylinders in a cylinder trolley. vi) Damaged hose. vii) Using domestic LPG cylinders viii) Fail to store cylinder 6.6m away from fire prone materials ix) Fail to use hose clamps x) Fire extinguisher not placed in the vicinity during operation	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance

19.	Welding	i) Voltmeter and Ammeter not working ii) Improper grounding and return path. iii) Damaged welding cable iv) Bare openings in the cable. v) Non-availability of separate switch in the transformer vi) Non-availability of main switch control to switch off power to the welding unit. vii) Usage of reinforcement rod as return conductor viii) Damaged holder ix) Fire extinguisher not placed in the vicinity during operation	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance
20.	Fire precaution	i) Smoking and open flames in fire prone area ii) Using more than 24V portable electrical appliances in the fire prone area iii) Not proper ventilation in cylinder storage area. iv) Absence of fire extinguishers v) Fire extinguishers not refilled once in a year. vi) Fire extinguisher placed in a not easily accessible location	Rs.5,000 per single violation Compounded to a maximum of Rs.25,000 at any single instance.
21.	Excavation, Tunnelling and confined space	i) Non-compliance of clause 34.1.1 ii) Non-compliance of clause 34.2.3 iii) Non-compliance of clause 34.3	For any item from i) and ii) Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance. For item iii) Rs.10,000 per first violation and Rs.50,000 for subsequent violations
22.	Work permit system	i) Non-compliance of clause 35.2 ii) Non-compliance of clause 21.11.9	For item I) and ii) Rs.50,000 per first violation and Rs.1,00,000 for subsequent violations
23.	Traffic Management	i) Non-compliance of clause 36.4.1 ii) Non-compliance of clause 36.8.3 iii) Non-compliance of clause 36.9.2 iv) Non-compliance of clause 36.9.3 v) Non-compliance of clause 36.9.7 vi) Non-compliance of clause 36.9.8	Rs.1,00,000 per first violation and Rs.2,00,000 for subsequent violations

		a) Barricades i) Not Cleaned ii) Not in alignment iii) Not numbered iv) Not painted v) Red lights / reflectors not working vi) Damages not repaired vii) Not secured properly viii) Barricade inspector not employed ix) Protruding parts / portions repaired x) Barricades maintaining register not properly maintained up to date	Rs.25,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
		b) Contractor Vehicles 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.	Rs.25,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
		c) Splashing of Bentonite on roads / non-cleaning of tyres of dumpers and transit mixers 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.	For item i) and ii) a) Rs.1,00,000 on first observation. b) Rs. 2,00,000 on second observation c) Rs. 3,00,000 on third and subsequent observations
24.	Batching plant / Casting yard	Non-adherence of any of the provisions mentioned in clause 38.0.	Rs. 10,000 for single violation compounded to a maximum of Rs.1,00,000 at any single instant.
25.	PPE	i) Not having ii) Not wearing (or) using and kept it elsewhere iii) Using damaged one iv) Using wrong type v) Using wrong colour helmet or helmet without logo vi) Using for other operation (e.g. Using safety helmet for storing materials or carrying water from one place to other) vii) Not conforming to BIS standard	From item i) to vi). Rs.200 per single violation For item vii) Rs.10,000 for first violation and Rs.50,000 for subsequent violations For item viii) Rs.50,000 for first violation and Rs.1,00,000 for subsequent violations

		viii) Non-compliance of clause 39.6, 39.7 and 39.8	
26.	Occupational Health	i) Fail to conduct Medical examination to workers ii) Absence of ambulance van & room iii) Workers not having ID card iv) Inadequate number of toilets v) Toilets not cleaned properly vi) Absence of water facilities for toilets and washing places vii) Toilet placed more than 500m from the work site viii) Absence of drinking water ix) Absence of first-aid person in work site. x) Absence or inadequacy of first-aid box. xi) Misuse of first-aid box. xii) First-aid box not satisfy the minimum Indian standard. xiii) Smoking inside the construction site xiv) Drink and drive or work xv) Excessive noise and vibration xvi) Canteen not provided xvii) Food stuff not served on no loss no profit basis xviii) Creche not provided xix) Accommodation not provided as per BOCWA xx) Fumigation / insecticides not sprayed to prevent Mosquito breeding xxi) Non-compliance of clause 44.1 and 44.2	Rs.10,000 per single violation Compounded to a maximum of Rs.1,00,000 at any single instance
27.	Labour Welfare measures	i) Non adherence of Labour welfare provisions of BOCWA ii) Fail to register establishment and display the registration certificate at workplace iii) Absence of workers register and records iv) Absence of muster roll and wages register v) Fail to display an abstract of BOCWA and BOCWR	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance
28.	Environmental Management	i) Tyre wash facility not provided ii) Spillage from vehicles not arrest iii) Air monitoring not practiced iv) Noise monitoring not practiced v) The values of air monitoring and noise monitoring not with in acceptable limits vi) Dust control measures at sites not	Rs.10,000 per single violation Compounded to a maximum of Rs.50,000 at any single instance

		practiced vii) Improper disposal of debris / residues	

56.4 **Without limiting to the unsafe acts and or conditions mentioned above in clause 56.3 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 56.3.**

57.0 Stoppage of work

57.1 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.

57.2 The contractor shall not proceed with the work until he has complied with each direction to the satisfaction of Employer

57.3 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.

58.0 Awards

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.

APPENDIX

	JAIPUR METRO RAIL CORPORATION LTD.
APPENDIX NO.: 1	

Memorandum of Understanding between Jaipur Metro Rail Corporation (JMRC) and the Contractor for safe execution of contract work

This Memorandum of Understanding is made and executed by and between Jaipur Metro Rail Corporation Ltd. (JMRC), a Company registered under the Companies Act 1956 and having its registered office at Khanij Bhawan, Udyog Bhawan Premises, Tilak Nagar, C-Scheme, Jaipur-302005 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 and assigns) of the one party
AND

M/s _____ having its registered office at _____ 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:

(a) Tender Documents, including Notice Inviting Tender, General Conditions, Special Conditions,
(b) Conditions of Contract on Safety, Health and Environment and Project Safety, Health and Environment Manual.
(c) Building and Other Construction Workers (Regulations of Employment and Conditions of Service) Act 1996, Central Rules 1998 and subsequent Rajasthan Government Rules 2009, Building and Other Construction Workers Welfare Cess Act 1996 and Rules 1998 and Rajasthan Building and Other Construction Workers' Welfare Board Rules and
(d) Indian Electricity Act 2003 and Rules 1956.
(e) Corresponding International / Bureau of Indian Standard Codes.

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 JMRC 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 JMRC	For and on behalf of (Contractor)
_____	_____
Signature:	Signature:
Name:	Name:
Title:	Title:

	JAIPUR METRO RAIL CORPORATION LTD.
APPENDIX NO.: 2	

Safety, Welfare and Occupational Health requirements as per BOCW Act 1996 and Rules 1998 and Rajasthan BOCW Rules 2009.

(This list has been prepared in chronological order with primary importance to **S**ection of Act and secondary importance to **R**ules)

S - Refers relevant **S**ections in BOCWA
R - Refers relevant **R**ules in BOCWR
C - Refers relevant **C**hapter No. in BOCWR

Sl. No.	1. Items	Relevant Sections / Rules in BOCWA and BOCWR and RBOCWR
2.	Registration of establishment	S – 7, R – 23 to 27
3.	Display of registration certification at workplace	R – 26 (5)
4.	Hours of work	S – 28 R – 234 to 237
5.	Register of overtime	S – 28; S – 29 R – 241(1) Form XXII
6.	Weekly rest and payment at rest	R – 235
7.	Night shift	R – 236
8.	Maintenance of workers registers and records	S – 30 R – 238
9.	Notice of commencement and completion	S – 46 R – 239
10.	Register of persons employed as building workers	R – 240
11.	Muster roll and wages register	R – 241(1) (a); Form XVI and XVII
12.	Payment of wages	R – 248
13.	Display of notice of wages regarding	R – 249
14.	Register of damage or loss	R – 241(1)(a); Form XIX, XX, XXI
15.	Issue of wages book	R – 241(2)(a); Form XXIII
16.	Service certificate for each workers	R – 241(2)(b); Form XXIV
17.	Display an abstract of BOCWA and BOCWR	R – 241(5)
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.	Delhi BOCW welfare Board Rules	R – 250 to 296

29.	Safety committee	S – 38 R – 208
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

76.	Medical examination for occupational health hazards	R – 233(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 Rajasthan Rule 277
85.	Power of inspectors	Central rule 251 Rajasthan rule 278

	JAIPUR METRO RAIL CORPORATION LTD.
APPENDIX NO.: 3	

CONTENT OF SHE PLAN	
Contract No	
Contractor Name	
Project Name	

1	**Project Highlights** i. Title of the content ii. Contractor Number iii. Brief scope of work iv. Location map/ key plan v. Period of the project
2	**SHE Policy**
3	**Site Organisation Chart** Chart indicating reporting of SHE personnel
4	**Roles & Responsibility** Individual responsibility of the i. Project Manager ii. Construction Manager iii. Construction Supervisors iv. SHE Committee Members v. SHE Incharge vi. Site Engineers vii. First Line Supervisors viii. Sub-contractors
5	**SHE Committee** i. Details - Chairman, Members, Secretary and Employer's representative, ii. Procedures for effective conduct of meeting
6	**SHE Training**
7	**Subcontractor Evaluation, Selection and Control**
8	**SHE Inspection**
9	SHE Audit
10	Accident Investigation And Reporting Procedures

11	**Occupational Health Measures**
12	**Labour Welfare Measures**
13	**Risk assessment and mitigation procedures**
14	**Safe Work Procedures** i. Work at Height ii. Structural Steel Erection iii. Launching of segments iv. Floor, Wall Openings and Stairways v. Welding, Cutting and Bracing vi. Lifting appliances vii. Work Permit Systems viii. Electrical Equipments ix. Mechanical Equipments x. Excavation xi. Fire Prevention xii. Hazardous Chemicals and Solvents xiii. Ionising Radiation xiv. Lighting xv. Abrasive Blasting
15	**Work Permit System**
16	**List of standard job specific PPEs to be used in the site**
17	**Maintenance of Regime for construction Equipment and Machinery**
18	**Traffic management**
19	**Housekeeping**
20	**Environmental Management**
21	**Emergency Management**
22	**Visitors and Security arrangement**

	JAIPUR METRO RAIL CORPORATION LTD.
APPENDIX NO.: 4	

WORKPLACE POLICY ON HIV/AIDS PREVENTION & CONTROL FOR WORKMEN ENGAGED BY CONTRACTORS

"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

Jaipur Metro Rail Corporation (JMRC) 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, JMRC 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 Rajasthan State Aids Control Society (RSACS).

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/001	

MINIMUM MANPOWER REQUIREMENTS OF SHE ORGANIZATION BASED ON CONTRACT VALUE

	1	2	3	4	5	6
Awarded Contract value (in Cr.)	**Chief SHE Manager**	**Senior SHE Manager**	**Junior SHE Manager**	**Safety Steward**	**Senior SHE (Electrical) Engineer**	**Junior SHE (Electrical) Engineer**
Upto 2	-	-	1	Refer Note 1	-	1
Upto 10	-	1	Refer Note 1		1	Refer Note 2
Upto 25	1	Refer Note 1			1	
Upto 100	1				1	
Upto 250	1				1	
More than 250	1				1	

	7	8	9	10	11	12	13
Awarded Contract value (in Cr.)	***Junior SHE (Fire) Manager / **Senior SHE (Fire) Manager**	**Occupational Health officer** with Necessary Nursing Assistants (Refer Note3)	**Environmental Manager**	**Senior SHE (Traffic) Engineer** (Refer Note4)	**Barricade Maintenance Squad** (Refer Note4)	**House Keeping Squad**	**Labour Welfare Officer**
Upto 2	-	-	-	-	Refer Note 5	Refer Note 6	-
Upto 10	-	1 (PT)	1	1			1
Upto 25	1*	1 (PT)	1	1			1
Upto 100	1*	1 (FT)	1	1			1
Upto 250	1**	2(FT)	1	1			1 with support staff
More than 250	2**	2(FT)	1 with support staff	1			1 with support staff

Note 1: Adequate, qualified and trained SHE Professionals with required support staff to be deployed at each worksite at each shift.

Note 2: Adequate, qualified and trained Electrical Engineers / supervisors to be deployed at each worksite at each shift.

Note 3: (PT) means Part-Time and (FT) means Full-time.

Note 4: 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 5: One Barricade Manager supported by required supervisors and workmen

Note 6: One Housekeeping Manager supported by required supervisors and workmen

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/002	

MINIMUM QUALIFICATION AND EXPERIENCE FOR (SHE) SAFETY, ELECTRICAL, ENVIRONMENTAL, TRAFFIC ENGG. AND OCCUPATIONAL HEALTH PROFESSIONALS

Sl. No	Designation	Qualification	Experience (in years)
1	Chief SHE Manager	The Chief SHE Manager shall have qualified in any of the following degree/diploma: i) Post Graduate Diploma in Industrial Safety & Environmental Management (PGDISEM) from National Institute of Industrial Engineering, Mumbai ii) M.E. in Industrial Safety from NIT, Trichy, Tamil Nadu iii) M.E. in Industrial Safety from Mepco Schlenk Engineering College, Sivakasi, Tamil Nadu iv) B.E. in Fire and Safety Engg. From Cochin University of Science and Engg. Cochin, Kerala v) B.E. with advanced Safety Management Diploma from CLI / RLI Mumbai / Chennai / Kolkata and Kanpur. vi) B.E / B.Arch., with one year Full Time advanced Safety diploma from NICMAR, Hyderabad. vii) B.E/B.Tech with any other equivalent State and Central Govt. recognized full time Degree / Diploma in Safety. viii) International qualifications like CSP (Certified Safety Professional), NEBOSH, MIOSH, MSISO etc.	2 {for all category except (iv) and 5yrs for category (iv)}
2	Senior SHE Manager (Refer Note 3)	As stated in Sl. No:1 and in addition the following categories: i) B.Sc.(Physics/Chemistry/Maths) with one year Full Time advanced Safety diploma from NICMAR, Hyderabad ii) B.Sc. / Diploma in Engg. with advanced Safety Management Diploma from CLI / RLI / Mumbai / Chennai / Kolkata and Kanpur. 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. 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	2 {for category (i), (ii) and (iii) only}
3	Junior SHE Manager (Refer Note 3)	i) Degree in Science / Diploma in Engineering with Govt. recognized safety diplomas from Correspondence	2 (for category (i) only)

		course of NICMAR, Annamalai University, National and State Productivity Councils, Other State Technical Education Boards etc. 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	
4	Safety Steward (Refer Note 3)	Any basic qualification with any SHE related certificate courses.	2
5	Senior SHE (Electrical) Manager	Degree in Electrical Engineering + Govt. recognized Electrical Licence holder	2
6	Junior SHE (Electrical) Manager	Diploma in Electrical Engineering + Govt. recognized Electrical Licence holder	1
7	Senior SHE (Fire) Manager	i) B.E. (Fire) from National Fire Service College, Nagpur 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)
8	Junior SHE (Fire) Manager	Any Diploma holder with any Govt. recognized diploma in Industrial Fire Safety.	1
9	Occupational Health Officer	MBBS with Govt. recognized degree/diploma in Industrial/ occupational health	1
10	Environment Manager	Govt. recognized PG Degree / PG Diploma / Degree in Environmental Engineering / Science	2
11	Senior SHE (Traffic) Engineer	Govt. recognized PG Degree / Degree / Diploma in Traffic/Transportation Engineering or Planning	1
12.	House Keeping Squad -Manager	Any Diploma in Engineering	1
13	Barricade Manager	Any Diploma in Engineering	1
14	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 JMRC Projects they can be considered for the following posts:

i) Senior SHE Manager
ii) Junior SHE Manager
iii) Safety Steward

depending upon the qualification and no. 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 3 (i), (ii) and (iii) irrespective their earlier experience with JMRC projects the candidates shall qualify as specified above.

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/003	

MINIMUM REQUIREMENTS OF SHE MONITORING AND AUDIO-VISUAL EQUIPMENTS

1. 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

2. 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.

3. 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.

Sl.No	**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)	1	1	1	1
2.	Portable hand held Digital Lux Meter	1	1	1	1
3.	Laptop Computer with standard configuration including multi media 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 can not 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				
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				

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction: JMRC/SHE/GI/004	

Training of Contractor's Employees/Staff/Worker's

Contractor shall provide a training/workshop on safety, health & environment (SHE) to all its workers/staff/employees/subcontractors of at least 2 weeks (96 hrs) at the time of induction. Before posting of any his worker's/staff/employees/subcontractors, the contractor shall give a certificate that the said person had undergone the requisite SHE training. Non compliance of the above will invoke penalties as per the condition of contract on SHE, of Tender Document.

The training shall cover following aspects:-

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/CPR

4. Duties of the contractor

- Brief outline of the responsibilities of the Contractor by law
- Details of Contractor's accident prevention policy
- JMRC's SHE manual
- Building and other Constructions Welfare Law

5. Employee's Duties

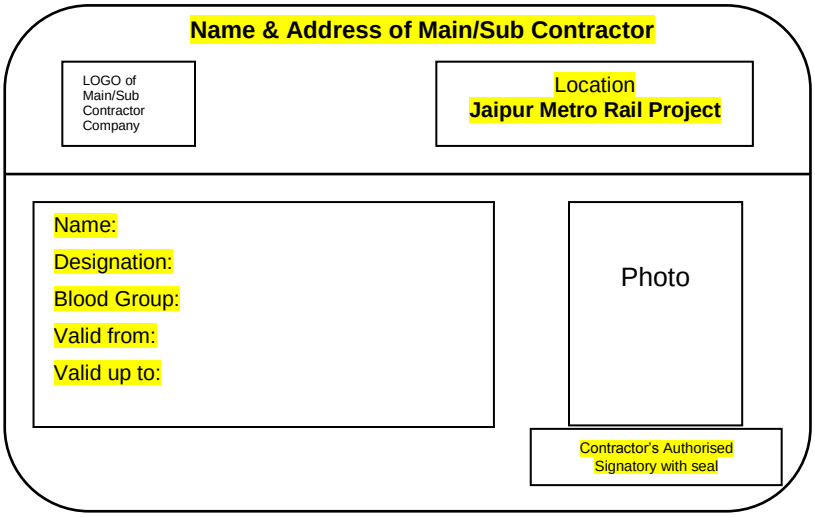
- Brief outline of responsibilities of employee under law
- Explanation of how new employees fit into the Contractor's plan for accident prevention. (induction and orientation).

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/005	

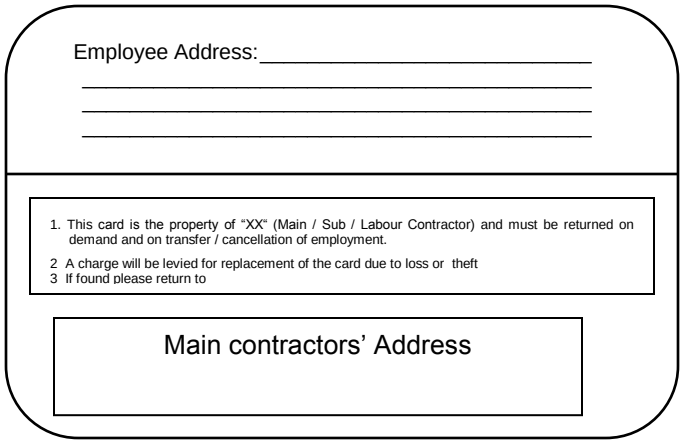
ID Card Format

(85 mm x 55mm)

Front side of ID Card:



Backside of ID Card:



	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/006	

SHE Training details for Managers and Supervisors

1. The Law and Safety	**2. Policy and Administration**
Statutory requirement Appropriate regulations Duties of employer and employee	Effect of incentive on accident prevention Human relations Consultation Safety Officer: duties, aims, objectives
3. Safety and the Supervisor	**4. Principles of Accident Prevention**
Safety and efficient production go together Accidents affect morale and public relations	Attitudes of management, supervision and operations Methods of achieving safe operations Accident and injury causes
5. Site Inspection	**6. Human Behavior**
The role of management Hazard Identification Procedure Records results Follow-up procedures Feedback	Motivating agencies Individual behavior Environmental effects Techniques of persuasion
7. Site housekeeping	**8. Health**
Site organization Relationship of site housekeeping to accident occurrence Site access Equipment storage Material stacking Materials handling	Medical examination Hazard to health on site Sanitation and welfare Protective clothing First Aid/CPR
9. Personal Protective Equipment	**10. Electricity**
Eye, face, hands, feet and legs Respiratory protective equipment Protection against ionizing radiation	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)
11. Oxygen and Acetylene Equipment	**12. Equipment**
Cylinder storage and maintenance Condition and maintenance of valves, regulators, and gauges Condition and maintenance of hoses and fittings Pressures	Accidents related to moving parts of machinery Appreciation of principles of guarding Importance of regular maintenance

3. Transportation	**14. Excavations**
Transport to and from site Hazard connected with site transport Competent drivers Dumpers Tipping trucks Movement near excavations	Method of shoring Precautions while shoring Precautions at edge of excavations Removal of shoring Sheet steel piling
15. Working platforms, Ladders, and Scaffolding	**16. Cranes and other Lifting Machines**
Hazards connected with the use of ladders Maintenance and inspection Type of scaffold Overloading Work on roofs Fragile material Openings in walls and floors Use of safety belts and nets	Licensing, certification and training required for operation of cranes Slinging methods Signaling Access to crane(s) Maintenance and examination Ground conditions Hazards and accident prevention methods connected with the use of different types of cranes/heavy equipment Crane Lift Plan for all lifts
17. Lifting Tackle	**18. Fire Prevention and Control**
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
19. Communications	
Effective methods of communication (particular interest to non-English speaking workers) Method and preparation of reports Safety committees Safety meeting	

SHE Training Matrix

Types of training	Management																			Supervisor										Specific															
	SHE Orientation	SHE Leadership	SHE Plan	SHE Improvement Plan	Management of Change	SHE Audit & Inspection	SHE Emergency Response & Preparedness	Incident/Accident Investigation & Reporting	SHE Communication	SHE Promotion & Incentives	Traffic Management	Hazard Identification & Risk Analysis	Permit to work system	Confined space entry	scaffolding	Waste Management	Environment Monitoring	Labour welfare measures	Behavioral Based Safety Management (BBSM)	Job/Task Safety Analysis (JSA)	Safety Training Observation Programme (STOP)	Industrial First Aid & CPR	Incident / Accident Investigation & Reporting	Fire fighting	Confined Space Testing & Certification	Scaffold Erection & Inspection	Rigging	Wire Rope Inspection	Crane Inspection	Electrical/Mechanical Isolation	Permit to Work System	Confined Space Working	Explosive Handling & Control	Heavy Lifting Operation	Radiography (X-Ray)	HAZMAT Handling & Control	Welding, Cutting & Bracing	Power Actuated Hand Tool	Electrical/Mechanical Isolation	Roofing Work	Steel erection work	Scaffold Erection/Dismantling	False-work Erection / Dismantling	Painting in Confined Area
Project Manager	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•																					
Sr. Construction Managers	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•							•									
Quality Manager	•	•	•	•	•		•	•	•		•	•	•	•	•	•		•	•	•	•																					
Planning engineer	•	•	•		•	•	•	•	•			•		•							•																					
Construction Managers	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				•	•	•	•	•												
Construction Supervisors	•		•	•	•	•	•	•	•	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Construction Foreman	•		•				•		•			•	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Machinery Operators	•						•				•					•						•	•			•																
Material Handlers	•						•					•	•		•							•	•			•																
Station Building Workers	•						•						•		•	•						•		•					•			•		•		•		•	•		•	•
Steel workers	•						•						•		•	•						•		•		•			•			•		•	•		•	•		•	
Mechanical workers	•						•									•						•		•		•			•	•		•		•			•	•			•
Other Civil workers	•						•									•						•		•		•			•	•	•	•		•			•	•		•	•
Electrical workers	•						•									•						•		•		•			•	•		•		•			•	•		•	•
Radiographers	•						•									•						•		•					•	•			•	•					•		
Transportation Drivers	•						•				•					•						•		•																	
Security Officers	•						•	•			•	•	•		•	•						•	•	•																	
Clerical Staff	•						•									•						•		•																	
Medical Doctor	•	•	•				•	•							•	•		•				•																				
Sr. SHE Managers		•					•								•		•					•																				
Jr. SHE Managers	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SHE Supervisors	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

DAYS TO BE OBSERVED FOR CREATING SHE AWARENESS

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/008	

1st Monday to Sunday of January	Road Safety Week (Subjected to confirmation from Ministry of Road Transport, Govt. of India every year.)
16th February	Kyoto Protocol Day
March	Red Cross Month
May 1 to 7	Emergency Preparedness Week
4th March	National Safety Day
7th April	World Health Day
14th April	Fire Safety Day
April 18 to 22	Earth Week
20th April	Earth Day
20th April	Noise Awareness Day
28th April	ILO World Day for Safety and Health at Work Day
5th June	World Environmental Day
12th June	World Day against Child Labours
9th July	Occupational Health Day
17th October	World Trauma Day
1st December	World AIDS Day

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/009	

Minimum Requirements of SHE Communication Posters / Signage / Video

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 No.: 1 - Minimum No. of Posters

Sl.No	**SHE Poster Title**	**Minimum No. of concepts in 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.	Crane Safety	5	Each 25	Each 50	Each 75	Each 200
8.	Slings	5	Each 25	Each 50	Each 75	Each 200
9.	Rigging Procedures	5	Each 25	Each 50	Each 75	Each 200
10.	Excavation	5	Each 25	Each 50	Each 75	Each 200
11.	Occupational Health (Mosquito Control, HIV/AIDS awareness, Dust Control, Noise Control, No Smoking/Spitting, etc.)	10	Each 25	Each 50	Each 75	Each 200
12.	First – Aid	3	Each 25	Each 50	Each 75	Each 200
13.	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
14.	Importance of “Safety Handbook”	1	25	50	75	200
15.	Traffic Safety (Speed limit, safe crossing and working within barricaded area etc.)	5	Each 25	Each 50	Each 75	Each 200
16.	Environmental Monitoring (Spillage of Muck, hazardous material, Improper drainage, water spray for dust containment etc.)	5	Each 25	Each 50	Each 75	Each 200
17.	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 No.: 2 – Size of Posters / Signages

Sl.No	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.	Safety 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 No.: 3 – Safety Signage Colour (as per IS 9457)

Sl.No	Type of signage	Colour
1	Mandatory	Blue
2	Danger	Yellow
3	Prohibitory	Red
4	Safe conditions	Green

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction : JMRC/SHE/GI/010	

Experts / Agencies for SHE Services

Sl. No.	Organisation	Services
1.	Bureau Veritas India Pvt. Ltd., B-21 & 22, First Floor, Sector-16, NOIDA-201 301 (U.P.) Phone: 0120 – 2515055, Fax: 0120 - 2515248 E-mail: enp.delhi@in.bureauveritas.com	• External SHE Audit • SHE Management / Technical Training
2.	Central Labour Institute Post box no: 17851 N.S.Monkikar Marg Sion , Mumbai- 400 022 Tel.: 022- 4092203, Fax: 022 – 4071986 E-mail: cli@dgfasli.nic.in	• SHE Management / Technical Training
3.	Construction Industry Development Council 801, 8th Floor, Hemkunt Chambers, 89, Nehru Place,, New Delhi – 110 019	• 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, Savitri Sadan 1, 11 Preet Vihar Community Centre, New Delhi-110 092 Phone: 011-2253 1502/2253/1503, 2242 7688/2253 1278 Fax: 011-2253 0247 Website: www.dnv.com	• External SHE Audit • SHE Management / Technical Training
6.	Dr. A. V. Baliga Memorial trust Link House Bagadur Shah Zafar Marg Press Area, New Delhi – 110 002 Phone: 011 – 23311119	• HIV / AIDS awareness

7.	DuPont Safety Resources, E.I. DuPont India Private Limited, Arihant Nitco Park 6th Floor, 90, Dr. Radhakrishnan Salai, Mylapore, Chennai-600 004 Phone: 044-2847 2800, 2847 3752 Fax: 044-2847 3800 Mobile: 9381201040 Website: in.dupont.com	• SHE Management Training
8.	EQMS INDIA PVT. LTD. E-49, 1st Floor, Dazzle House, Jawahar Park, Main Vikas Marg, Laxmi Nagar, Delhi-110 092 Phone: 91-11-220 17639/2204 4754 Fax: 91-91 2201 5150 E-mail: eqms@eqmsindia.org Website: www.eqmsindia.com	• ISO Certification • SHE Management / Technical Training
9.	Green Cross Consultants 59, 7th Cross, 1st Floor, Jai Bharath Nagar, Banglore-560 033 Phone: 080-2549 6782 E-mail: etgrangan@yahoo.com	• SHE Management / Technical Training
10.	HSRTC, PENTASAFE, 201, 2nd Floor, Town Centre, Andheri Kurla Road, Marol, Andheri (East), Mumbai-400 059 Phone: 022-2850 2210/20/50 Fax: 022-2850 2260 E-mail: training@penta-safe.com Website: www.penta-safe.com	• SHE Practical Field Training for Height Safety
11.	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.
12.	Institute for Research, Development & Training of Construction Trades & Management, An Educational Institute, Society and Trust, 1st Floor, UVCE Alumni Association Building, K.R. Circle, Banglore-560 001 Phone: 080-22294291/22243257 Fax: 080-22243257 E-mail: ubrco@vsnl.com Website: www.instructindia.org	• SHE Technical /Field Training

13.	International Engineering Company K – 10, South Extension, Part – 2, New Delhi – 110 049 Phone: 011 – 26254761, 26258130 Mobile: 9312260130 E-mail: ashok@intenco.net	• Crane and Lifting appliances and Gears Certification • SHE Practical Field Training for Crane Safety
14.	L & T Eutectic 32, Sivaji Marg New Delhi – 110 015 Phone: 011 - 51419538, 51419539 Fax: 011 - 51419600 Website: www.lnteutecticwelding.com	• SHE Practical Field Training for Welding Safety
15.	Loss Prevention Association of India Ltd. Warden House, Sir P.M. Road, Mumbai – 400 001 Website: www.lpaindia.org	• SHE Management / Technical Training
16.	MFA Crucial Moments Healthcare Pvt. Ltd., 42, Okhla Industrial Estate, Phase – II New Delhi – 110 020 Phone: 011 – 55624000 Fax: 011 – 55624010 E-mail: contact@crucialmoments.net	• First-aid Training
17.	Modicare Foundation 4 Community Centre, New Friends Colony, New Delhi – 110 065 Phone: 011 – 5167235059 Fax: 011 – 26915469 E-mail: nivedita@modi.com, nivedita@gmail.com Website: www.modicarefoundation.org	• HIV / AIDS awareness
18.	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
19.	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

20.	Quality Growth Services Pvt. Ltd. H-13, Kirti Nagar, New Delhi – 110 015 Fax: 011 – 25431737 / 25438598 / 25918332 E-mail: qgs@qgspl.com Website: www.qgspl.com	• ISO Certification
21.	Safety Engineers Association / Safety Educational Trust – India 2/257, First Floor, Dr. Ambedkar Nagar, Manapakkam, Chennai – 600 116 Phone: 044 – 22523461 E-mail: safetrustindia@rediffmail.com	• SHE Management / Technical Training
22.	SHE Management Consultancy & Support Services, 145 A, Pocket-VI, (DDA Flats), Kondli Gharoli, Mayur Vihar-II, Delhi-110 096 Fax: 011-2262 5015 Mobile: 9811153873 E-mail: r_k_p@vsnl.net	• SHE Management / Technical Training
23.	St. Johns' Ambulance Red Cross Road New Delhi – 110 001	• First-aid Training
24.	Vexil Business Process Services Pvt. Ltd. 208, A/4, Savitri Nagar, New Delhi – 110 017 Mobile: 9350232714, 98102832201, 9350232716 E-mail: info@vexilbps.com Website: www.vexilbps.com	• Emergency Preparedness Mock drill • SHE Management / Technical Training
25.	Welding Research Institute Bharat Heavy Electricals Ltd. (BHEL) Trichirappalli, Tamil Nadu – 620 014 Phone: 0431 – 2577029, 2577283 Fax: 0431 – 2520770 E-mail: wri@bheltry.co.in	• SHE Practical Field Training for Welding Safety
26.	Dr Cris Research Centre for Occupational Health & Safety 306, Guru Arjuna Dev Bhawan Ranjit Nagar Complex, New Delhi-08 Ph: 9810040406 Fax: 011-25702929 Email: team@drcris.com www.drcris.com	• Ambulance • Communication Material • First Aid Training • HIV/AIDS Awareness • ID Card • Medical Facilities • SHE training

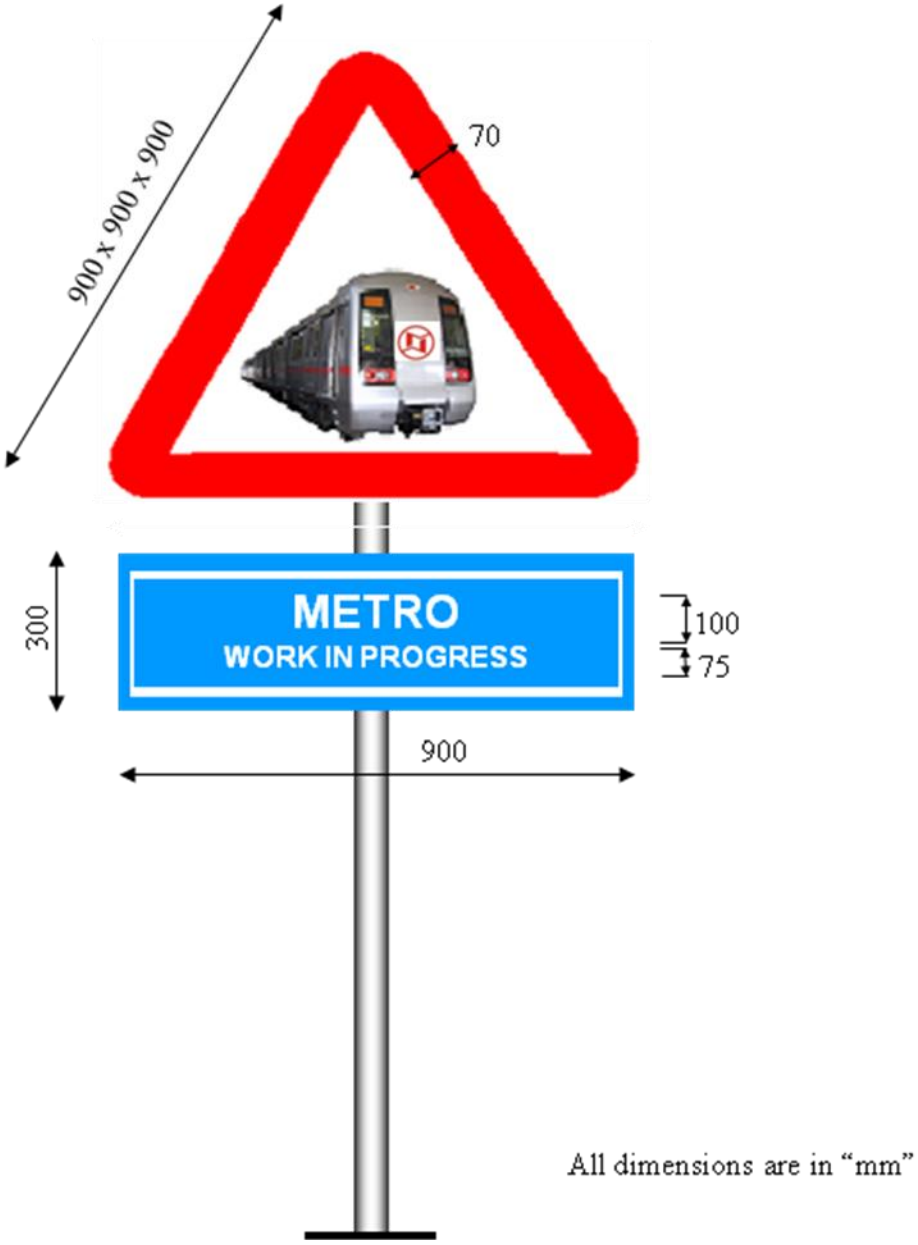
	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction: JMRC/SHE/GI/011	

Minimum Lighting Requirements

S.N.	A. Facility or Function	Luminance – lx (lm/ft^2)
B. 1.	Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)
C. 2.	**D. Construction areas** - general indoor - general outdoor - tunnel and general underground work areas (minimum 110 lux required at tunnel and shaft heading during drilling, mucking and scaling)	 55 (5) 33 (3) 55 (5)
E. 3.	**F. Access ways** - exit ways, walkways, ladders, stairs	 110 (10)
4.	**G. Maintenance / Operating areas / shops** - vehicle maintenance shop - carpentry shop - outdoors field maintenance area - refueling area, outdoors - shops, fine details work - shops, medium detail work - welding shop	 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.	**H. Warehouses and storage rooms/area** - indoor stockroom, active/bulk storage - indoor rack storage - outdoor storage	 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)

	JAIPUR METRO RAIL CORPORATION LTD.
General Instruction: JMRC/SHE/GI/012	

SIGNAGE



	JAIPUR METRO RAIL CORPORATION LTD.
FORM No. : SF/001	

FORMATION OF SITE SHE COMMITTEE	
Contract No	
Contractor Name	
Contract Title	

CIRCULAR

Committee

The following SHE Committee is constituted with immediate effect:
Chairman:
Members:
1)
2)
3)
4)
5)
Secretary:

Periodicity

The committee will meet at least once in a month on the day (specify date)

Agenda

Secretary will circulate agenda of the meeting at least two days in advance of the schedule date of the meeting.

Circulation

Gist of the meeting will be minuted in the standard format and circulated to the following under the signature of the secretary

1. Chairman
2. Members
3. JMRC Representatives
5. Others concerned

Date: Signed By: ----------
CHAIRMAN

	JAIPUR METRO RAIL CORPORATION LTD.
FORM No. : SF/002	

MINUTES OF SHE COMMITTEE MEETING			
Contract No.			
Contractor Name			
Contract Title			
Meeting No.		Date of Meeting	
Location of Meeting			

MEMBERS PRESENT	INVITEES	MEMBERS ABSENT

REPORT SENT TO					
No. of Copies	Name / Dept.	No. of Copies	Name / Dept.	No. of Copies	Name / Dept.
Prepared by:		Location:		Date:	

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			
10	Observation of SHE committee during last walk down			

Next SHE Meeting is scheduled on:

Date:	**Chief SHE Manager (Signature & Name)**
Date:	**Project Manager (Signature & Name)**

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 7 – General Conditions of Contract (GCC)

Section 8 – Particular Conditions of Contract (PCC)

Section 9 – Contract Forms (COF)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

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Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 7 – General Conditions of Contract (GCC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

Section 7- General Conditions of Contract

The General Conditions of Contract (GCC), shall be read in conjunction with the Particulars Conditions of Contract (PCC) and Annexure

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General Conditions of Contract

A. General

1. Definitions

1.1 Boldface type is used to identify defined terms.

(a) The **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.

(b) The **Activity Schedule** is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.

(c) The **Adjudicator** is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 29.1 [Appointment of Adjudicator] hereunder.

(d) **Bank** means the financing institutions named in the **Particular Conditions of Contract (PCC)**.

(e) **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

(f) **Compensation Events** are those defined in GCC 51.1 [Compensation Events] hereunder.

(g) The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with GCC 69.1 [Completion].

(h) The **Contract** is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC 2.3 below.

(i) The **Contractor** is the party whose Bid to carry out the Works has been accepted by the Employer.

(j) The **Contractor's Bid** is the completed bidding document submitted by the Contractor to the Employer.

(k) The **Contract Price** is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.

(l) **Days** are calendar days; months are calendar months.

(m) **Dayworks** are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

(n) A **Defect** is any part of the Works not completed in accordance with the Contract.

(o) The **Defects Liability Certificate** is the certificate issued by the Project Manager upon correction of defects by the Contractor.

(p) The **Defects Liability Period** is the period calculated from the

Completion Date where the Contractor remains responsible for remedying defects.

(q) **Drawings** include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(r) The **Employer** is the party who employs the Contractor to carry out the Works, as specified in the **PCC.**

(s) **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

(t) **Force Majeure** means an exceptional event or circumstance: which is beyond a Party's control; which such Party could not reasonably have provided against before entering into the Contract; which, having arisen, such Party could not reasonably have avoided or overcome; and, which is not substantially attributable to the other Party.

(u) **In writing** or **written** means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

(v) The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

(w) The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the **PCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

(x) **Letter of Acceptance** means the formal acceptance by the Employer of the Bid and denotes the formation of the Contract at the date of acceptance.

(y) **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(z) **Party** means the Employer or the Contractor, as the context requires.

(aa) **PCC** means Particular Conditions of Contract.

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

(cc) The **Project Manager** is the person named in the **PCC** (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

(dd) **Retention Money** means the aggregate of all monies retained by the Employer pursuant to GCC 55.1 [Retention].

(ee) **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.

(ff) The **Site** is the area defined as such in the **PCC**.

(gg) **Site Investigation Reports** are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(hh) **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(ii) The **Start Date** is given in the **PCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

(jj) A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

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

(ll) A **Variation** is an instruction given by the Project Manager which varies the Works.

(mm) The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the **PCC.**

2. Interpretation

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

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

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Contract Agreement,

(b) Letter of Acceptance,

(c) Letter of Bid,

(d) Particular Conditions of Contract,

(e) the List of Eligible Countries that was specified in Section 5 of the bidding document,

(f) General Conditions of Contract,

(g) Specifications,

(h) Drawings,

(i) Completed Activity Schedules or Bill of Quantities, and

(j) any other document listed in the **PCC** as forming part of the

Contract.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the **PCC**.

3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer's country when

(a) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's Country prohibits any import of goods from, or any payments to, a particular country, person, or entity. Where the borrower's country prohibits payments to a particular firm or for particular goods by such an act of compliance, that firm may be excluded.

4. Contract Agreement

4.1 The Parties shall enter into a Contract Agreement within 28 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the attached Contract forms in Section 8. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

5. Assignment

5.1 Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party

(a) may assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party; and

(b) may, as security in favor of a bank or financial institution, assign its right to any moneys due, or to become due, under the Contract.

6. Care and Supply of Documents

6.1 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.

6.2 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.

6.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (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.

6.4 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.

7. Confidential Details

7.1 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 the Contractor's compliance with the Contract and allow

its proper implementation.

7.2 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. Each of them shall not publish or disclose any particulars of the Works prepared by the other Party without the previous agreement of the other Party. However, the Contractor shall be permitted to disclose any publicly available information, or information otherwise required to establish his qualifications to compete for other projects.

7.3 Notwithstanding the above, the Contractor may furnish to its Subcontractor(s) such documents, data and other information it receives from the Employer to the extent required for the Subcontractor(s) to perform its work under the Contract, in which event the Contractor shall obtain from such Subcontractor(s) an undertaking of confidentiality similar to that imposed on the Contractor under this Clause.

8. Compliance with Laws

8.1 The Contractor shall, in performing the Contract, comply with applicable Laws.

8.2 Unless otherwise stated in the Particular Conditions,

(a) the Employer shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which (i) such authorities or undertakings require the Employer to obtain in the Employer's name, and (ii) are necessary for the execution of the Contract, including those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract;

(b) the Contractor shall acquire and pay for all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings in the [Employer's Country or country where the Site is located] which such authorities or undertakings require the Contractor to obtain in its name and which are necessary for the performance of the Contract, including, without limitation, visas for the Contractor's and Subcontractor's personnel and entry permits for all imported Contractor's Equipment. The Contractor shall acquire all other permits, approvals, and/or licenses that are not the responsibility of the Employer under Subclause 8.2(a) hereof and that are necessary for the performance of the Contract. The Contractor shall indemnify and hold harmless the Employer from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the Employer or its personnel, including the Subcontractors and their personnel, but without prejudice to Subclause 8.1 hereof.

9. Joint and Several Liability

9.1 If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally liable to the Employer for the fulfillment of the provisions of the Contract, and shall designate one of such persons to act as a leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be

altered without the prior consent of the Employer.

10. Project Manager's Decisions

10.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

11. Delegation

11.1 The Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

12. Communications

12.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

13. Subcontracting

13.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

14. Other Contractors

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

15. Personnel and Equipment

15.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid to carry out the functions stated in the Schedule or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

15.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within 7 days and has no further connection with the work in the Contract.

15.3 If the Employer, Project Manager, or Contractor determines, that any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or other prohibited practices during the execution of the Works, then that employee shall be removed in accordance with Clause 15.2 above.

16. Employer's and Contractor's Risks

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

17. Employer's Risks

17.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to

(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works, or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

17.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the Completion Date.

18. Contractor's Risks

18.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks, are Contractor's risks.

19. Insurance

19.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the **PCC** for the following events, which are due to the Contractor's risks:

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

(b) loss of or damage to Equipment;

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

(d) personal injury or death.

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

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

19.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

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

20. Site Investigation Reports

20.1 The Contractor, in preparing the Bid, shall rely on any Site Investigation Reports referred to in the **PCC,** supplemented by any information available to the Contractor.

21. Contractor to Construct the Works

21.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

22. The Works to Be Completed by the Intended Completion Date

22.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

23. Designs by Contractor and Approval by the Project Manager

23.1 The Contractor shall carry out design to the extent specified in the **PCC**. The Contractor shall promptly submit to the Employer all designs prepared by him. Within 14 days of receipt, the Employer shall notify any comments. The Contractor shall not construct any element of the permanent work designed by him within 14 days after the design has been submitted to the Employer or where the design for that element has been rejected. Design that has been rejected shall be promptly amended and resubmitted. The Contractor shall resubmit all designs commented on, taking these comments into account as necessary.

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

23.3 The Contractor shall be responsible for design of Temporary Works.

23.4 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

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

23.6 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.

24. Safety

24.1 The Contractor shall be responsible for the safety of all activities on the Site.

25. Discoveries

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

26. Possession of the Site

26.1 The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the **PCC,** the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

27. Access to the Site

27.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

28. Instructions, Inspections, and Audits

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

28.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and subconsultants to keep accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.

28.3 The Contractor shall permit ADB to inspect the Contractor's accounts, records, and other documents relating to the submission of bids and contract performance and to have them audited by auditors appointed by ADB. The Contractor shall maintain all documents and records related to the Contract for a period of three (*3*) years after completion of the Works. The Contractor shall provide any documents necessary for the investigation of allegations of fraud, collusion*,* coercion, or corruption and require its employees or agents with knowledge of the Contract to respond to questions from ADB.

29. Appointment of the Adjudicator

29.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority designated in the **PCC**, to appoint the Adjudicator within 14 days of receipt of such request.

29.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract, a new Adjudicator shall be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority at the request of either party, within 14 days of receipt of such request.

30. Procedure for Disputes

30.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Project Manager's decision.

30.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

30.3 The Adjudicator shall be paid by the hour at the rate specified in the **PCC,** together with reimbursable expenses of the types specified in the **PCC**, and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision shall be final and binding.

30.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place specified in the **PCC**.

B. Staff and Labor

31. Forced Labor

31.1 The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor–contracting arrangements.

32. Child Labor

32.1 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 national laws 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.

33. Workers' Organizations

33.1 In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the Contractor shall comply with national law. Where national law substantially restricts workers' organizations, 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 national law is silent, the Contractor shall not discourage the Contractor's Personnel from forming or joining workers' organizations 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 organizations and bargain collectively. The Contractor shall engage with such workers representatives. Worker organizations are expected to fairly represent the workers in the workforce.

34. Nondiscrimination and Equal Opportunity

34.1 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 national law provides for non-discrimination in employment, the Contractor shall comply with national law. When national laws are silent on nondiscrimination in employment, the Contractor shall meet this Subclause'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.

C. Time Control

35. Program

35.1 Within the time stated in the **PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.

35.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

35.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period stated in the **PCC.** If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount stated in the **PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.

35.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

36. Extension of the Intended Completion Date

36.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

36.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

37. Acceleration

37.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.

37.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

38. Delays Ordered by the Project Manager

38.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

39. Management

39.1 Either the Project Manager or the Contractor may require the other to

Meetings

attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

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

40. Early Warning

40.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

40.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

D. Quality Control

41. Identifying Defects

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

42. Tests

42.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

43. Correction of Defects

43.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the **PCC.** The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

43.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

44. Uncorrected Defects

44.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

E. Cost Control

45. Contract Price

45.1 In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

45.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for Materials on Site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.

46. Changes in the Contract Price

46.1 In the case of an admeasurement contract:

(a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25%, provided the change exceeds 1% of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.

(b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15%, except with the prior approval of the Employer.

(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

46.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

47. Variations

47.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.

47.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

47.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

47.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

47.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

47.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC 46.1 [Changes in the Contract Price] or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.

48. Cash Flow Forecasts

48.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

49. Payment Certificates

49.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

49.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

49.3 The value of work executed shall be determined by the Project Manager.

49.4 The value of work executed shall comprise,

(a) in the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed; or

(b) in the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.

49.5 The value of work executed shall include the valuation of Variations and Compensation Events.

49.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

50. Payments

50.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing

rate of interest for commercial borrowing for each of the currencies in which payments are made.

50.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

50.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.

50.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

51. Compensation Events

51.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC 26.1 [Possession of the Site].

(b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

51.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the

Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

51.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

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

52. Tax

52.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC 54.1 [Price Adjustment].

53. Currencies

53.1 Where payments are made in currencies other than the currency of the Employer's country specified in the **PCC,** the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

54. Price Adjustment

54.1 Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the **PCC.** If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type indicated below applies to each Contract currency:

$$\mathbf{P_c = A_c + B_c\ Imc/Ioc}$$

where:

P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

A_c and B_c are coefficients[1] specified in the **PCC,** representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

[1] The sum of the two coefficients A_c and B_c should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulas for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a

Imc is a consolidated index prevailing at the end of the month being invoiced and Ioc is the same consolidated index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

54.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

55. Retention

55.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the **PCC** until Completion of the whole of the Works.

55.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 69.1 [Completion], half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" bank guarantee.

56. Liquidated Damages

56.1 The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the **PCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the **PCC.** The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

56.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC 50.1 [Payments].

57. Bonus

57.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the **PCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

58. Advance Payment

58.1 The Employer shall make advance payment to the Contractor of the amounts stated in the **PCC** by the date stated in the **PCC,** against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer in amounts and currencies equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance

very approximate figure (usually 0.10 ~ 0.20) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency is added to the Contract Price.

payment.

58.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

58.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

59. Securities

59.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount specified in the **PCC,** by a bank acceptable to the Employer, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a bank guarantee.

60. Dayworks

60.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

60.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within 2 days of the work being done.

60.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

61. Cost of Repairs

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

F. Force Majeure

62. Definition of Force Majeure

62.1 In this Clause, "Force Majeure" means an exceptional event or circumstance,

(a) which is beyond a Party's control;

(b) which such Party could not reasonably have provided against before entering into the Contract;

(c) which, having arisen, such Party could not reasonably have

avoided or overcome; and

(d) which is not substantially attributable to the other Party.

62.2 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:

(a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies;

(b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war;

(c) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel;

(d) munitions of war, explosive materials, ionizing 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

(e) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

63. Notice of Force Majeure

63.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, 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 within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

63.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.

63.3 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.

64. Duty to Minimize Delay

64.1 Each Party shall at all times use all reasonable endeavours to minimize any delay in the performance of the Contract as a result of Force Majeure.

64.2 A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

65. Consequences of Force Majeure

65.1 If the Contractor is prevented from performing its substantial obligations under the Contract by Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to GCC Subclause 30.1 [Procedure for Disputes] to

(a) an extension of time for any such delay, if completion is or will be delayed, under GCC Subclause 36 [Extension of the Intended

Completion Date]; and

(b) if the event or circumstance is of the kind described in sub-paragraphs (a) to (d) of GCC Subclause 62.2 [Definition of Force Majeure] and, in the case of subparagraphs (b) to (d), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destructed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in GCC Subclause 19 [Insurance].

65.2 After receiving this notice, the Project Manager shall proceed in accordance with GCC Subclause 10 [Project Manager's Decisions] to agree or determine these matters.

66. Force Majeure Affecting Subcontractor

66.1 If any Subcontractor 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 nonperformance or entitle him to relief under this Clause.

67. Optional Termination, Payment and Release

67.1 If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under GCC Subclause 63 [Notice of Force Majeure], or for multiple periods which total more than 140 days 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 GCC Subclause 73.5 [Termination].

67.2 Upon such termination, the Project Manager shall determine the value of the work done and issue a Payment Certificate, which shall include

(a) the amounts payable for any work carried out for which a price is stated in the Contract;

(b) the Cost of Plant and Materials 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;

(c) other Costs or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

(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

(e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.

68. Release from

68.1 Notwithstanding any other provision of this Clause, if any event or

Performance

circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises, which makes it impossible or unlawful for either or both Parties to fulfill 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,

(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

(b) the sum payable by the Employer to the Contractor shall be the same as would have been payable under GCC Subclause 67 [Optional Termination, Payment and Release] if the Contract had been terminated under GCC Subclause 67.

G. Finishing the Contract

69. Completion

69.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the work is completed.

70. Taking Over

70.1 The Employer shall take over the Site and the Works within 7 days of the Project Manager's issuing a certificate of Completion.

71. Final Account

71.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

72. Operating and Maintenance Manuals

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

72.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **PCC** pursuant to GCC 72.1**,** or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the **PCC** from payments due to the Contractor.

73. Termination

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

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

(a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been

authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 84 days of the date of the Project Manager's certificate;

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

(f) the Project Manager gives two consecutive Notices to update the Program and accelerate the works to ensure compliance with GCC Subclause 22.1 [The Works to be Completed by the Intended Completion Date] and the Contractor fails to update the Program and demonstrate acceleration of the works within a reasonable period of time determined by the Project Manager;

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

(h) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **PCC**; and

(i) if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC 74.1 [Fraud and Corruption].

73.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC 73.2 above, the Project Manager shall decide whether the breach is fundamental or not.

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

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

74. Fraud and Corruption

74.1 ADB's Anticorruption Policy requires that Borrowers (including beneficiaries of ADB-financed activity), as well as Contractors, Subcontractors, Manufacturers, and Consultants under ADB-financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the ADB

(a) defines, for the purposes of this provision, the terms set forth below as follows:

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

(ii) "fraudulent practice" means 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;

(iii) "coercive practice" means 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;

(iv) "collusive practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party;

(v) "obstructive practice" means (a) deliberately destroying, falsifying, altering, or concealing of evidence material to an ADB investigation; (b) making false statements to investigators in order to materially impede an ADB investigation; (c) failing to comply with requests to provide information, documents or records in connection with an Office of Anticorruption and Integrity (OAI) investigation; (d) 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 (e) materially impeding ADB's contractual rights of audit or access to information; and

(vi) "integrity violation" is any act which violates ADB's Anticorruption Policy, including (i) to (v) above and the following: abuse, conflict of interest, violations of ADB sanctions, retaliation against whistleblowers or witnesses, and other violations of ADB's Anticorruption Policy, including failure to adhere to the highest ethical standard.

(b) will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations in competing for the Contract;

(c) will cancel the portion of the financing allocated to a contract if it determines at any time that representatives of the borrower or of a beneficiary of ADB-financing engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations during the procurement or the execution of that contract, without the borrower having taken timely and appropriate action satisfactory to ADB to remedy the situation; and

(d) will impose remedial actions on a firm or an individual, at any time, in accordance with ADB's Anticorruption Policy and Integrity Principles and Guidelines (both as amended from time to time), including declaring ineligible, either indefinitely or for a

stated period of time, to participate[2] in ADB-financed, administered, or supported activities or to benefit from an ADB-financed, administered, or supported contract, financially or otherwise, if it at any time determines that the firm or individual has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices or other integrity violations.

75. Payment upon Termination

75.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the **PCC.** Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

75.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

76. Property

76.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

77. Release from Performance

77.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterward to which a commitment was made.

78. Suspension of ADB Loan or Credit

78.1 In the event that ADB suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made,

(a) the Employer is obligated to notify the Contractor, with copy to the Project Manager, of such suspension within 7 days of having received ADB's suspension notice.

(b) if the Contractor has not received sums due it within the 28 days for payment provided for in GCC 50.1 [Payments], the Contractor may immediately issue a 14-day termination notice.

[2] Whether as a Contractor, Nominated Subcontractor, Consultant, Manufacturer or Supplier, or Service Provider; or in any other capacity (different names are used depending on the particular Bidding Document). A Nominated Subcontractor is one which either has been: (i) included by the Bidder in its prequalification application or bid because it brings specific and critical experience and know-how that are accounted for in the evaluation of the Bidder's prequalification application or the bid; or (ii) appointed by the Employer.

79. Eligibility

79.1 The Contractor shall have the nationality of an eligible country as specified in Section 5 [Eligible Countries] of the bidding document. The Contractor shall be deemed to have the nationality of a country if the Contractor is a citizen or is constituted, or incorporated, and operates in conformity with the provisions of the laws of that country. This criterion shall also apply to the determination of the nationality of proposed subcontractors or suppliers for any part of the Contract including related services.

79.2 The materials, equipment, and services to be supplied under the Contract shall have their origin in eligible source countries as specified in Section 5 [Eligible Countries] of the bidding document and all expenditures under the Contract will be limited to such materials, equipment, and services. At the Employer's request, the Contractor may be required to provide evidence of the origin of materials, equipment, and services.

79.3 For purposes of GCC 79.2, "origin" means the place where the materials and equipment are mined, grown, produced, or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing, or substantial or major assembling of components, a commercially recognized product results that differs substantially in its basic characteristics or in purpose or utility from its components.

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 8 – Particular Conditions of Contract (PCC)

Issued on November 2016

Invitation For NCB No.: JP/EW/1B/JFT-1

Employer **JAIPUR METRO RAIL CORPORATION LTD.**
Khanij Bhawan, Tilak Marg,
C- Scheme, Jaipur (Rajasthan) PIN-302005
Country: India

Section 8 - Particular Conditions of Contract

The following Particular Conditions of Contract (PCC) shall supplement the General Condition of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the GCC. The clause number of PCC is the corresponding clause number of the GCC.

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Particular Conditions of Contract

A. General		
1	**GCC 1.1 (d)**	The financing institution is : Asian Development Bank
	GCC 1.1 l	The Employer is :Jaipur Metro Rail Corporation (JMRC) and its legal successors or permitted assigns.
	GCC 1.1 (w)	The Intended Completion Date for the whole of the Works shall be 16.02.2018.
	GCC 1.1 (cc)	The Project Manager/Engineer is Authorized Officer of DMRC
	GCC 1.1 (ff)	The Site is located at Jaipur and is defined in drawings No. DMRC/JP/1B/Track Alignment Dated 17.08.2016
	GCC 1.1 (ii)	The Start Date shall be 12.02.2017
	GCC 1.1 (mm)	The Works consist of Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India.
2	**GCC 2.2**	Sectional Completions are: 1 Chandpole to Badi Chaupar including reversal / stabling lines beyond Badi Chaupar station.
	GCC 2.3 (j)	The following documents also form part of the Contract : 1. Addendums (if any) 2. GAD's
3	**GCC 3.1**	The language of the contract is English The law that applies to the Contract is the law of INDIA
4	**GCC 11.1**	The Project Manager may delegate any of his duties and responsibilities.
5	**GCC 14.1**	Schedule of other contractors as: The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the **PCC.** The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.
6	**GCC 19.1**	The minimum insurance amounts and deductibles shall be: (a) for loss or damage to the Works, Plant and Materials: INR 500,000 (Indian Rupees Five Hundred Thousand) for each occurrence. Number of occurrences unlimited. (b) for loss or damage to Equipment: INR 500,000 (Indian Rupees Five Hundred Thousand) for each occurrence. Number of occurrences unlimited. (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract: INR 500,000 (Indian Rupees Five Hundred Thousand) for each occurrence. Number of occurrences unlimited.

		(d) for personal injury or death: (i) of the Contractor's employees: INR 500,000 (Indian Rupees Five Hundred Thousand) for each occurrence. Number of occurrences unlimited. (ii) of other people: INR 500,000 (Indian Rupees Five Hundred Thousand) for each occurrence. Number of occurrences unlimited.
7	**GCC 20.1**	Site Investigation Reports are: Not Applicable
8	**GCC 23.1**	The following shall be designed by the Contractor: As per contract.
9	**GCC 26.1**	The Site Possession Date(s) shall be Chandpole launching shaft/ Chhoti Chaupar Station, Jaipur, 12.02.2017
10	**GCC 29.1**	➢ Appointment (if not agreed) to be made by:- Employer.
		➢ Rules of procedure for arbitration proceedings :- As per law of the Republic of India.
		➢ **Following is added to the clause 29.1 of GCC:** **Disputes and 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 touching or relating to construction/manufacture, measuring operation or effect of the Contract or the breach thereof shall be referred to Arbitration in accordance with the following provisions: a) Matters to be arbitrated upon shall be referred to a sole Arbitrator if the total value of the claim is upto 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 for the claims upto Rs.5 million and a panel of five Arbitrators 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 or 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 and 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 Jaipur only. The language of proceedings, that of documents and communication shall be English. b) 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. c) 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. **Interest on Arbitration Award** Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period, till the date on which the award is made. **Cost of Arbitration** The cost of arbitration shall be borne by the respective parties. The cost shall, inter alia, include the fees of the arbitrator (s) as agreed by both the parties or provided under the International Arbitration Rules. **Jurisdiction of Courts** Where recourse to a Court is to be made in respect of any matter, the court at Jaipur shall have the exclusive jurisdiction to try all disputes between the parties. **Suspension of Work on Account of Arbitration** The reference to Conciliation / Arbitration shall proceed not withstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, Engineer and the Contractor shall not be altered by reasons of arbitration being conducted during the progress of the Works. Neither party shall be entitled to suspend the work or part of the work to which the dispute relates on account of arbitration and payments to the Contractor shall continue to be made in terms of the Contract.
11	**GCC 30.3**	The Adjudicator shall be paid by the hour at the rate of: To be decide mutually The reimbursable expenses are: To be decided mutually
	GCC 30.4	Institution whose arbitration procedures shall be used: **Contracts with domestic contractors:** Arbitration shall be conducted in accordance with the laws of the Employer's country.
C. Time Control		
12	**GCC 35.1**	The Contractor shall submit for approval a Program for the Works within **15 days** from the date of the Letter of Acceptance.
	GCC 35.3	The period between Program updates is **30** days. The amount to be withheld for late submission of an updated Program is **INR 70,000**
D. Quality Control		
13	**GCC 43.1**	The Defects Liability Period is: 365 days. **Following is added to the clause 43.1 of GCC** Defect liability period shall be 12 months from the date of issue of Completion

		certificate for the facilities or any part thereof. During the Defects Liability Period the Contractor shall provide, free of cost, competent and skilled personnel and maintain adequate stock of spares so as to promptly utilize his obligations during the Defects Liability Period as laid down in GCC and Employer's Requirements. A penalty of Rs.10000/- per day in DLP period will be imposed if major equipment or any complete system is not working for more than 24 Hrs. Maintenance during Defects Liability Period, 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 stations/section 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. 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. **Routine Maintenance** Submit Monthly status report to the Engineer –in – Charge. **Repairs** All equipment / installation (as per the work define in bid) that requires repairing hall be immediately serviced and repaired. **Complaints** The Contractor shall receive calls for any and all problems experienced in the operation of the systems of P-way, attend to these within 120 minutes of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist. **Maintenance Log Book.** The Contractor shall maintain a Maintenance Log Book and the format for which shall be approved by Engineer – in – charge. In the Maintenance Log book the details about date of Routine Maintenance, Routine Maintenance activities performed, Details of Call – out visit / Break – down maintenance, etc. shall be maintained. Copy of relevant pages of the Log book to be submitted to the Engineer – in – charge with the Monthly status report. **Failure Analysis Report.** The Contractor shall submit a report for the Failure Analysis in the format approved by the "Engineer" giving the details of the type of fault, cause of fault, analysis of faulty component, etc correlated with the details of last preventive maintenance activity performed. The Contract shall not be considered to be completed until the Performance Certificate has been signed by the Engineer and delivered to the Contractor at the end of 'Defect Liability Period, stating the date on which the Contractor completed his obligations related to completion of works and rectification of defects during Defect Liability Period to the Engineer's satisfaction. Only the Performance Certificate shall be deemed to constitute approval of the Works.
E. Cost Control		
14	**GCC 47**	**Following is added to the clause 47 of GCC** 1. 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 itemsor group of items, specified in the Bill of Quantities.

2. Such variations shall be paid as follows:

a) 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 mentioned therein and not to individual items. In case of variation in quantities on minus side, contract rates will be payable for executed quantities.

b) In case of foundation work, no variation limit applies and Contractor shall carry out the Work, at rates stipulated in the Contract irrespective of any variation.

c) 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.

d) 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.

e) Variation in the quantity of items individually costing upto 1% of the total contract value, shall be payable at the rates stated in the Contract. Notwithstanding the magnitude of variation upto 2% of the original Contract Value for each item.

f) In case the variation in individual items or the group of items as stipulated above, is more than 25% (positive or negative) , the rate for the varied quantity beyond 25% shall be negotiated between the Engineer and the Contractor and mutually agreed rates arrived at before actual execution of the extra quantity.

g) In case Engineer introduces an item for which the Contract does not contain any rates or prices applicable to the varied Works, the rate of such items shall be derived, wherever possible, from rate for similar items available in the Bill of Quantities of the accepted Bid. In case this is not possible, the rate may be decided on the following basis:

i. Cost of Materials at current market price, as actually utilized in the final finished Permanent Works, including a reasonable percentage for wastage and transportation.

ii. 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.

iii. 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 utilized at Site and other ancillary and incidental expenses on labour.

iv. Hire charges for Plant & 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 & Machinery for this purpose. v. An amount of 20% of items (i), (ii), (iii) and (iv) above to allow for Contractor's overheads, profits and corporate taxes. This percentage shall also apply to estimated cost of Materials supplied free to the Contractor. vi. In all cases where extra 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, of at least 7 days before the need for their execution arises. h) In the event of disagreement in respect of items (f) and (g) above, the Engineer shall fix such rates of price 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 and the Engineer shall be free to get such additional quantities beyond 25% new items executed through any other agency. 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 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.
15	**GCC 52**	**Following is added to the clause 52 of GCC** The rates and prices quoted in the Bill of Quantities shall be quoted separately in the following currencies: a) For inputs to the Works, which are expected to be supplied from within India, in Indian Rupees. b) For those inputs to the Works, which are expected to be supplied from outside India, in foreign currencies. The Contract Price shall not be adjusted on account of fluctuations in the rates of exchange between the foreign currencies of the Contract and Indian Rupees. The Bidder is required to note the following while quoting his prices:- As this project is funded by Asian Development Bank (ADB), the project is governed by the following exemptions. **A. Custom Duty and Excise Duty** 1. The project is eligible for exemption of custom duty as per notification no. 84/97-customs dated 11.11.1997, as amended by notification no. 85/99-cus. Dated 06.07.1999 and no. 119/99-cus. Dated 02.11.1999 and notification no. 75/2001 dated 0-07-01 and notification no. 107/2001-cus. Dated 12.10.2001 2. The project is eligible for exemption of Excise duty as per notification no. 108/95- CE, dated 28.08.1995, as amended vide central excise notification no. 7/98-CE, dated02.06.1998; 33/98-CE, dated 13.10.1998; 4/99- CE dated 11.02.1999 and 40/99- CE, dated 02.11.1999.

		Note: 1. Amendments to above notifications, if any, up to the date 28 days prior to the deadline for submission of bids shall also be deemed to be taken into consideration in the Contract Price. The copy of above notification is attached as **Annexure-I** to the PCC. Note: 2. In order to seek exemptions of Custom Duty and/or Excise Duty the JMRC shall issue the required certificates for the project on the request of the contract. **B. VAT, Rajasthan Entry Tax ~~and Service Tax~~** :- 1. Bidder to note that as per the following Notifications of Government of Rajasthan, Rajasthan Value Added Tax and Rajasthan Entry Tax on certain goods are exempted for this Contract and Bidder shall take into consideration these exemptions in their Contract Price: **Rajasthan Tax on Entry of Goods into Local Areas Act, 1999:** Notification No. F.12 (100)FD/Tax/10-81 dated 6th October 2010 issued by Finance Department (Tax Division) of Government of Rajasthan. i. Amendment No. F.12(100)FD/Tax/10-76 dated 08th December 2011 ii. Amendment No. F.12(100)FD/Tax/2010-10 dated 17th April 2013 **Rajasthan Value Added Tax Act. 2003** Notification No. F.12 (100)FD/Tax/10-78 dated 6th October 2010 issued by Finance Department (Tax Division) of Government of Rajasthan. i. Amendment No. F.12(100)FD/Tax/10-73 dated 08th December 2011 ii. Amendment No. F.12(100)FD/Tax/10-11 dated 24th April 2013 iii. Amendment No. F.12(79)FD/Tax/2014-Pt-I-151 dated 08th Feb 2016 Notification No. F.12 (100)FD/Tax/10-79 dated 6th October 2010 issued by Finance Department (Tax Division) of Government of Rajasthan. i. Amendment No. F.12(100)FD/Tax/10-74 dated 08th December 2011**.** Notification No. F.12(63)FD/Tax/2005-81 dated 11th August 2006 issued by Finance Department (Tax Division) of Government of Rajasthan. i. Amendment No. F.12(100)FD/Tax/10-80 dated 06th October 2010 ii. Amendment No.F.12(100)FD/Tax/10-75 dated 08th December 2011 Note: 1. Amendment to above notifications, if any, up to the date 28 days prior to the deadline for submission of bids shall also be deemed to be taken into consideration in the Contract Price. The copy of above notification is attached as **Annexure – I** to the PCC.

		Note: 2. In addition to above exemptions (Custom Duty, Excise Duty, VAT, Rajasthan Entry Tax), if any other exemptions which are available to the contractor by virtue of any notification of Govt./Local Bodies existing as on 28 days prior to the submission of the bids, may be availed by the contractor and JMRC will issue the necessary required certificates for availing such exemptions on the request of the Contractor. **C. Bid Evaluation** 1. Since all taxes and duties are borne by the bidder service tax, it is to state that the exemption on construction erection, commissioning or installation of original works pertaining to *Metro Rail* has been withdrawn by GoI vide notification no. 9/2016-Service Tax dated 01.03.2016, w.e.f. 01.03.2016 & now the service tax is applicable on all such contracts to be executed on or after 01.03.2016. However, the abatement as available on original works; will be available and service tax is leviable on 40% of total value @ 14% = 5.6% on gross value plus cess, as applicable. The copy of above notification is attached as **Annexure-I** to the PCC. 2. The bidders shall quote fix lump sum price or as per BOQ price (as the case may be) inclusive of all taxes, levies, duties, cess, freight, insurance and all other incidental charges required to fulfills the contract requirements including statutory deduction viz., TDS towards Income Tax T/Works Contract Tax. Except the exemptions stated in clause A, B above. 3. However, any new taxes/duties or any statutory variation in the existing taxes/ duties applicable to the JMRC project during the contractual completion shall be to the employers account. The contractor shall furnish the documentary evidence in support of their claims, if any, for reimbursement from JMRC. However, any increase in cost due to new taxes/duties or any statutory variation in the existing taxes/duties applicable to the JMRC project during extended contractual period due to contractors fault shall be to contractor account, whereas any decrease in the taxes/duties shall be employers account. **D.** Taxes and duties paid to the sub-vendors shall not be paid separately and therefore are to be included in the price.
16	**GCC 53.1**	The currency of the Employer's country is: INR
17	**GCC 54.1**	The Contract is subject to price adjustment in accordance with GCC Clause 54: not applicable.
18	**GCC 55.1**	The proportion of payments retained is: 10%
19	**GCC 56.1**	The liquidated damages for the whole of the Works are *0.1%* per day. The maximum amount of liquidated damages for the whole of the Works is 10% of the final Contract Price.

20	**GCC 57.1**	No bonus will be given for earlier completion of the facilities or part thereof.
21	**GCC 58.1**	The Advance Payments shall be 10% and shall be paid to the Contractor no later than 21 Days. **Following is added to the clause 58.1 of GCC** **Advance Payment:** The advance shall be paid interest free against acceptable bank guarantee. Total advance payment shall be 10% of the Accepted Contract Amount. The first instalment shall be five percent (5%) payable within 21 days from the date of receipt of guarantees acceptable to the Employer. The second instalment shall be five percent (5%) payable on submission of proof of utilization of the first instalment for the works and the Employer is satisfied that the utilization has been done in purposeful manner. Advance shall be payable in the currencies and proportions in types and proportions of the currencies mentioned BOQ.
	GCC 58.3	Repayment of the Advance Payments shall be: 15% from each payment certificate. **Recovery of Advance:-** a) The recovery of advances shall commence when 20% of the original contract value of the work has been paid and it will be completed by the time 85% of the Contract Value has been paid or the completion date whichever is earlier. As far as possible the recovery of advances shall be limited to 30% of an account bill. b) No advance shall be given after 40% of the original contract amount has been paid. c) The contractor shall always have the option to have the recoveries commenced and/or completed earlier, and/or to have recoveries affected in instalments of higher amount and also to repay part or whole of the advance by direct payment ratherthan through on-account bills. d) In case the contract is terminated due to default of the contractor or rescinded/foreclosed due to any other reason, the contractor shall return the unrecovered amount of all advances within 15 days of issue of notice of termination/ rescission/fore closer of the contract and if the contractor fails to do so due to any reason whatsoever, then interest at an interest rate equal to State Bank of India prime lending rate plus 3% per annum or 12% per annum whichever is higher shall be charged on the unrecovered amount of such advances from 16 days onwards till the same is returned by the contractor.
22	**GCC 59.1**	The Performance Security amount is 10% of contract price. Following is added to the clause 59.1 of GCC The amount of performance security, as a percentage of the Contract Price for the Facility or for the part of the Facility for which a separate Time for Completion is provided, shall be 10% of the contract value in types and proportions of currencies in which the contract price is payable. The performance security shall not be reduced on the date of the Operational Acceptance. The value of Bank Guarantee can be revised “Once in a year” during the Contract period by the contractor with the consent / approval of the Employer. The reduction in the amount of Performance Security will be proportionate to the Equipment for which the DLP obligations have been completed.

		The performance security shall be in the form of the bank guarantee as perform included in Section 9 (Contract Forms).
		Forfeiture i. Failure of the successful Bidder to furnish the required Performance Security shall be a ground for the annulment of the award of Contract and forfeiture of the tender security. ii. The whole of the Performance Security amount shall be liable to be forfeited by the Employer at the discretion of the Employer, in the event of any breach of contract on the part of the Contractor. iii. On termination of contract due to contractor's default as per GCC Clause 73, the performance security shall be forfeited by encashing the bank guarantee and the balance work shall be got done independently without risk and cost of the failed contractor. 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 bid for the balance work either in his/her individual capacity or as a partner of any other JV/partnership firm. The Engineer shall not make a claim under the Performance Security except for amounts to which the JMRC is entitled under the contract (Not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of: a) Failure by the contractor to extend the validity of the Performance Security, in which event the Engineer may claim the full amount of the Performance Security. b) Failure by the contractor to pay JMRC any amount due, either as agreed by the contractor or determined under any or the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer. The contractor being determined or rescinded under provision of the GCC the Performance Security shall be forfeited in full and shall be absolutely at the disposal of the JMRC.
		Release i. On completion of the entire work, one half of the Performance Security shall be refunded to the Contractor, on issue of Completion Certificate by the Engineer, in accordance with GCC Clause 69. This shall not relieve the Contractor from his obligations and liabilities, to make good that may be detected during the Defects Liability Period. ii. The balance amount shall become due and shall be paid to the Contractor on signing of the Performance Certificate after the expiry of the final Defects Liability Period in accordance with GCC Clause 27 & PCC Clause 18.
G. Finishing the Contract		
23	**GCC 72.1**	The date by which operating and maintenance manuals are required is 16.01.2018 The date by which "as built" drawings are required is 16.01.2018

	GCC 72.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 72.1 is INR 15 Lacs
24	**GCC 73.2 (h)**	The maximum number of days is 100 days
25	**GCC 75.1**	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 40%
26	**Additional Clause**	**Disputes and 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 touching or relating to construction/manufacture, measuring operation or effect of the Contract or the breach thereof shall be referred to Arbitration in accordance with the following provisions: (a) Matters to be arbitrated upon shall be referred to a sole Arbitrator if the total value of the claim is upto 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 for the claims upto Rs.5 million and a panel of five Arbitrators 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 or 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 and 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 Jaipur only. The language of proceedings, that of documents and communication shall be English. (b) 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. (c) 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. **Interest on Arbitration Award** Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period, till the date on which the award is made. **Cost of Arbitration** The cost of arbitration shall be borne by the respective parties. The cost shall, inter alia, include the fees of the arbitrator (s) as agreed by both the parties or provided under the International Arbitration Rules. **Jurisdiction of Courts** Where recourse to a Court is to be made in respect of any matter, the court at Jaipur shall have the exclusive jurisdiction to try all disputes between the parties.

		Suspension of Work on Account of Arbitration The reference to Conciliation / Arbitration shall proceed not withstanding that the Works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, Engineer and the Contractor shall not be altered by reasons of arbitration being conducted during the progress of the Works. Neither party shall be entitled to suspend the work or part of the work to which the dispute relates on account of arbitration and payments to the Contractor shall continue to be made in terms of the Contract.
27	**Additional Clause**	**Labour laws** The Contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The Contractor shall base the employment relationship upon 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 or retirement, and discipline. The Contractor shall provide equal wages and benefits to men and women for work of equal value or type.
28	**Additional Clause**	**Quantity Variation** The quantities of items shown in the Bill of Quantities are approximate, and liable to vary during the actual execution of the work. The Contractor shall be bound to carry out and complete the stipulated work irrespective of variation in individual items, at the same rate as specified in the Bill of Quantities subject to variation in the value of the Contract being limited to 25% of the total original/enhanced value of the contract. The variations can be implemented anywhere in the network of JMRC.
29	**Additional Clause**	**Retention Money** Retention money equal to 10 percent of the amount due to the Contractor from each on account payment will be retained, so as to maintain a reserve in the hands of the Employer equal to 10 percent of the Contract Price. Contractor will have the option to submit Bank Guarantee in lieu of deduction of retention money. The Retention money shall be held by the Employer without obligation to invest them or account for interest thereon or to place them in a designated account. No interest of whatsoever nature and type will be payable by the Employer in respect of Retention monies. Retention money shall become due to the Contractor on the date of issue of the Completion Certificate of works in respective sections/corridors.
30	**Additional Clause**	**Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge – Methods** The Contractor shall submit complete documents and information pertaining to the methods of Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge which the Contractor proposes to adopt or use. 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 other works comprising the Project. The Engineer shall inform the Contractor in writing within a reasonable period after receipt of the above information;

		a) that the Contractor's proposed methods of manufacture, construction, execution, testing and commissioning (including Integrated Testing and Commissioning) have the approval of the Engineer; or b) in what respects, in the opinion of the Engineer, the Contractor's proposed methods of manufacture, construction, execution, etc: I. fail to comply with the Employer's Requirements; II. would be detrimental to the Works and/or to the other works comprising the Project; III. do not comply with the other requirements of the Contract; or c) as to the further documents or information which are required to enable the Engineer to properly assess the proposed methods of manufacture, etc. In the event that the Engineer does not give his approval, 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 approval. The Contractor shall not change the methods of manufacture, construction, execution, supply, installation, testing and commissioning (including Integrated Testing and Commissioning) which have received the Engineer's approval without further review and approval in writing of the Engineer. Notwithstanding the foregoing provisions of this Clause, or that certain of the Contractor's proposed methods of manufacture, etc. may be the subject of the approval of the Engineer, the Contractor shall not be relieved of any liability or obligation under the Contract.
31	**Additional Clause**	**Operation and Maintenance** The Contractor shall provide Expert team for Maintenance till the end of DLP and assistance in operation for initial 6 months from R.O.D. The deployment of these Experts and team shall be continuous. These Experts and team shall work under the administrative control of the Employer. These Experts and team shall also ensure that the Client's maintenance staff acquire necessary skills and follow correct procedures and practices in the maintenance, overhaul and repair of various components for the system as well as for the maintenance of the related software (if any) after the DLP. The qualification and experience of the Experts to be deployed by the Contractor shall be as prescribed in the Employer's Requirements. Prior approval of the Employer shall be necessary before the Experts are deployed for maintenance and operation. The Contractor shall replace promptly, Contractor's experts who are not considered suitable by the Engineer.
32	**Additional Clause**	**Indemnity Bond** The contractor shall submit an Indemnity Bond in the format given in **Annexure-II** against payments made for Plant and Equipment delivered to Jaipur.
33	**Additional Clause**	**Digitised Data** All Drawings, Proposal, Manuals, Design, Correspondence, Final Bid (Contract) documents and submittals etc. should be submitted in digitized form along with the Hard Copy. Price if any to be included in the quoted price.
34	**Additional Clause**	**Technology Transfer** The Contractor shall provide the Transfer of Technology as stipulated in bid document.

35	**Additional Clause**	**Quality Plan** The detailed Quality Plan shall be developed from the Outline Quality Plan to meet the stipulations of the Employer's Requirements. 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. 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. 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.
36	**Additional Clause**	**Work by persons other than the Contractor** If the Contractor shall fail to carry out any work required under the Contract or refuse to comply with any instruction or order given by the Engineer in accordance with the Contract within a reasonable time, the Engineer may give the Contractor 14 days' notice in writing to carry out such work or comply with such instruction. If the Contractor fails to comply with such notice, the Employer shall be entitled to carry out such work or instruction by his own workmen or by other contractors. Without prejudice to any other right or remedy, all additional expenditure properly incurred by the Employer in having such work or instruction carried out shall be recoverable by the Employer from the Contractor. If by reason of any accident or failure or other event occurring to, in, or in connection with the Works any remedial or other work shall, in the opinion of the Engineer, be urgently necessary and the Contractor is unable or unwilling at once to do such remedial or other work, the Engineer may authorise the carrying out of such remedial or other work by a person other than the Contractor. If the remedial or other work so authorised by the Engineer is work, which, in the Engineer's opinion, the Contractor was liable to do under the defect liability period Contract, all expenses properly incurred in carrying out the same shall be recoverable by the Employer from the Contractor, provided that the Engineer shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof in writing.
37	**Additional Clause**	**Entry with full preparation as per SHE** The contractor need to mobilize at site with full preparation with proper provision of display boards (mentioning various details like Contract Name, Contract Value, Scope, Organization, Contract Details, Labour Laws obligations as per agreement with the engineer), lighting, Water Supply, Ventilation Facility, Toilet Facility, Tea & Coffee facility, Cleaning arrangement etc (this list is indicative not exhaustive). The engineer shall approve after inspection and shall issue no objection certificate for erection of the equipment.

38	**Additional Clause**	**Nuisance** Contractor will be responsible for any unhygienic conditions in the area under their possession and liable to be penalized if condition does not improve despite warnings/notices
39	**Additional Clause**	**Interface Requirement** The contractor shall be responsible to interface with the other contractors as per the interface table provided in the contract. JMRC 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 and the ultimate responsibility of commissioning lies with the contractor.
40	**Additional Clause**	**Site Progress** The contractor shall prepare Performa in consultation with the engineer and submit to engineer the monthly progress report and will be required to deliver the Power Point presentation as and when instructed by the engineer.
41	**Additional Clause**	**Maintaining the Site** In general the cleanliness, lighting, safety, security, drinking water, first aid etc will be the responsibility of the civil contractor as specified in the interface document. 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 noticed by the engineer a minimum penalty of Rs. 5000/- shall be imposed for each instance.
42	**Additional Clause**	**Material not as per approved makes** Once the contractor has got the vendor approved the contractor shall procure the material from the 'approved' sources. In the event, material found at site from the unapproved sources, the engineer can decide not to pay the BOQ price for the same.
43	**Additional Clause**	**BOCW (Building and Other Construction Works) Cess** Bidders need to judge the applicability of BOCW for the work. Any liabilities on account of BOCW at any stage shall be on part of bidder and the quoted price shall be inclusive of BOCW charges. If same is not applicable, the bidder needs to submit required undertaking /certificates. The JMRC shall make the deduction accordingly and deposit the amount to the concerned authorities.
44	**Additional Clause**	**Bank Guarantee for Supplementary Agreement** The contractor shall submit the Bank Guarantee for 10 % value for works to be executed through supplementary agreement at the time of signing of the supplementary agreement. The bank Guarantee shall be valid till the 28 days beyond the completion of the works to be executed through supplementary agreement.
45	**Additional Clause**	**Professional Indemnity Insurance (PII)** The Contractor shall effect and maintain professional indemnity insurance, preferably in the name of JMRC, for the amount in Indian Rupees stipulated

		in Contract forms in respect of any design of the Works to be carried out by, or on behalf of the Contractor. This insurance, which shall ensure the Contractor's liability by reason of professional negligence and errors in the design of the works, shall be valid from the date of commencement of Works, until 5 years after the date of issue of Performance Certificate. Alternatively the Contractor shall redeem the insurance before the expiry of the Yearly Insurance in such a way that the entire validity period is covered. The Engineer will not issue Final Payment Certificate until the Contractor has produced evidence that coverage of the professional indemnity insurance has been provided for the aforesaid period. The Contractor shall, within the respective periods stated in the Bid documents (calculated from the Commencement Date), submit to the Employer: (a) evidence that the insurances described in this Clause have been effected, with an Insurance Company operating in India, and (b) copies of the policies for the insurances. When each premium has been paid, the contractor shall submit copy of receipts to the employer. The contractor shall also, when providing such evidence, policies and receipts to the employer, notify the engineer of so doing. The contractor shall effect all insurances for which he is responsible with insurers and in terms approved by the employer. Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify such loss or damage. Payments received from insurers shall be used for the rectification of such loss or damage. The contractor (and, if appropriate, the employer) shall comply with the conditions stipulated in each of the insurance policies. The contractor shall make no material alteration to the terms of any insurance without the prior approval of the employer. If an insurer makes (or purports to make) any such alteration, the-contractor shall notify the employer immediately. If the contractor fails to effect and keep in force any of the insurances required under the contract, or fails to provide satisfactory evidence, policies and receipts in accordance with this sub-clause, the employer may, without prejudice to any other right or remedy, effect insurance for the coverage relevant to such default, and pay the premiums due. In such cases the premium paid by the employer plus overheads (equal to 50% of the premium paid) 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 or recover the same as debt due from the contractor. The contractor shall not dispute the amount of premium paid by the employer or the overhead charges thereon. 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 amount not insured or not recovered from the insurers shall be borne by the contractor. The Contractor shall submit to the Engineer, the details of all claims made with the insurer and claims accepted by the insurer or any other details as required by the Engineer on monthly basis. **AOA** (any one accident) limit equal to **6%** of the contract value against BOQ 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% of AOA limit. PII 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'. 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 (5% of contract value) shall be retained till required validity period. The contractor's submission of such shorter period /renewable policy shall be constructed as their irrevocable consent for retention of the performance guarantee.
46	**Additional Clause**	**Extension of time of completion** The site shall be made available progressively and if some part is not made available then the extension of time shall be allowed only to the work/KD of that particular part.
47	**Additional Clause**	"Similar work'' for this contract shall be the work of installation of ballasted /ballastless track work on MRTS or main lines of passenger Railway Systems including High Speed Rail System including installation of ballastless track for a minimum length of 2 km. In case of double/multiple line, each line will be counted separately. The experience of installation of tracks on a system having design axle load less than 12 Tons, or portions of work having design speed less than 70 Kmph or Tramways shall not be considered. Components of ballastless track works in sidings, spurs and other non-passenger portions shall also not be considered.

Annexure-I

Seeks to Exempt Imports by United Nations or International organisation for execution of projects in India.

11-11-1997

Notification No. 84/97-Customs

In exercise of the powers conferred by sub-section (1) of section 25 of the Customs Act, 1962 (52 of 1962), read with sub-section (4) **of** section 68 of the Finance (No. 2) Act, 1996 (33 of 1996), the Central Government, being satisfied that it is necessary in the public interest so to do, hereby exempts all the **goods imported into India for execution of projects financed by the United Nations or an International Organisation** and approved by the Government of India, from the **whole of the duty of customs** leviable thereon under First Schedule to the Customs Tariff Act, 1975 (51 of 1975), the **whole of the additional duty of customs** leviable thereon under section 3 of the said Customs Tariff Act and the **whole of the special duty of customs** leviable under section 68 of the Finance
(No. 2) Act 1996 (33 of 1996):

Provided that the importer, at the time of clearance of the goods, produces before the Assistant Commissioner of Customs or Deputy Commissioner of Customs, as the case may be, having jurisdiction, -

(i) in case the said goods are -

(a) Imported by an international organisation listed in the Annexure appended to this notification and intended to be used in a project that has been approved by the Government of India and financed (whether by a loan or a grant) by such an organisation, a certificate from such organisation that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India; or

(b) imported for use in a project that has been approved by the Government of India and financed (whether by a loan or a grant) by an international organisation listed in the said Annexure, a certificate from an officer not below the rank of Deputy Secretary to the Government of India, in the Ministry of Finance (Department of Economic Affairs) that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India;

(ii) in case the said goods are intended to be used in a project financed (whether by a loan or a grant) by the World Bank, the Asian Development Bank or any other international organisation other than those listed in the Annexure, and the said project has been approved by the Government of India, a certificate from the executive head of the Project Implementing Authority and countersigned by an officer not below the rank of a Joint Secretary to the Government of India, in the concerned Line Ministry in the Government of India, that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India, and

(iii) in case the said goods are intended to be used in a project financed (whether by a loan or a grant) by the World Bank, the Asian Development Bank or any other international organisation, other than those listed in the Annexure and the said project has been approved by the Government of India for implementation by the Government of a State or a Union Territory, a certificate from the executive head of the Project Implementing Authority and countersigned by the Principal Secretary or the Secretary (Finance), as the case may be, in the concerned State Government or the Union Territory, that the said goods are required for the execution of the said project, and that the said project has duly been approved by the Government of India for implementation by the concerned State Government.

Explanation. - For the purposes of this notification, -

(a) "international organisation" means an international organisation to which the Central Government has declared, in pursuance of section 3 of the United Nations (Privileges and Immunities) Act, 1947 (46 of 1947), that the provisions of the Schedule to the said Act shall apply;

(b) "Line Ministry" means a Ministry in the Government of India, which has been so nominated with respect to a project, by the Government of India, in the Ministry of Finance (Department of Economic Affairs).

ANNEXURE

1. United Nations Development Programme,

2. United Nations International Childrens' Fund,

3. Food and Agricultural Organisation,

4. International Labour Organisation,

5. World Health Organisation,

6. United Nations Population Fund.

7. United Nations World Food Programme.

8. United Nations Industrial Development Organisation.

Notification No. 84/97-Cus.,dated 11-11-1997 as amended by Notification No. 85/99-Cus.,dated 6-7-1999 and No.119/99-Cus.,dated 2-11-1999.and Notification No.75/2001 dt.0-07-01 and Notification No. 107/2001-Cus.,dated 12.10.2001.

Cus Ntf No.85/1999 Date 6/7/1999

Imports for Projects financed by UN - Duty Exexption conditions changed

In exercise of the powers conferred by sub-section (1) of section 25 of the Customs Act, 1962 (52 of 1962), the Central Government, being satisfied that it is necessary in the public interest so to do, hereby makes the following amendment in the notification of the Government of India in the Ministry of Finance (Department of Revenue), No.84/97Customs, dated the 11th November, 1997, namely:

In the said notification,-

i. for the words "all the goods imported into India by the United Nations or an international organisation for execution of projects financed by them", the following words shall be substituted, namely:-

"all the goods imported into India for execution of projects financed by the United Nations or an international organisation"

ii. for the proviso, the following shall be substituted,. namely: -

"Provided that the importer, at the time of clearance of the goods, produces before the Assistant Commissioner of Customs or Deputy Commissioner of Customs, as the case may be, having jurisdiction:-

i. in case the said goods are intended to be used in a project financed (whether by a loan or a grant) by the United Nations and the said project has been approved by the Government of India, a certificate from an officer not below the rank of a Deputy Secretary to the Government of India, in the Ministry of Finance (Department of Economic Affairs), that the said goods are required for the execution of the said project financed by the United Nations and that the said project hat duly been approved by the Government of India, or

ii. in case the said goods are intended to be used in a project financed (whether by a loan or a grant) by the World Bank, the Asian Development Bank or any other international organisation, and the project has been approved by the Government of India, a certificate from the executive head of the Project Implementing Authority and countersigned by an officer not below the rank of a Joint Secretary to the Government of India, in the concerned Line Ministry in the Government of India, that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India, and

iii. in case the said goods are intended to be used in a project financed (whether by a loan or a grant) by the World Bank, the Asian Development Bank or any other international organisation, and the said project has been approved by the Government of India for implementation by the Government of a State or a Union Territory a certificate from the executive head of the Project Implementing Authority and countersigned by the Principal Secretary or the Secretary (Finance), as the case may be, in the concerned State

Government or the Union Territory, that the said goods are required for the execution of the said project, and that the said project has duly been approved by the Government of India for implementation by the concerned State Government";

iii. for the Explanation, the following Explanation shall be substituted, namely:-

"Explanation For the purposes of this notification,-

a. "international organisation" means an international organisation to which the central Government has declared, in pursuance of section 3 of the United Nations (Privileges and Immunities) Act, 1947 (46 of 1947), that the provisions of the Schedule to the said Act shall apply;

b. "Line Ministry" means a Ministry in the Government of India, which has been so nominated with respect to a project, by the Government of India, in the Ministry of Finance (Department of Economic Affairs)".

Sd/-
(Prashant Kumar Sinha)
Under Secretary to the Government of India

Issued by:
Ministry of Finance Department of Revenue
New Delhi.

Notification No. 108/95-CE, Dt. 28-8-95

Goods supplied to UN/Intni. Organisations or Proj.
As amended vide Central Excise Notification No. 7/98-CE, dt. 2-6-1998; 33/98-CE, dt. 13-10-1998; 4/99-CE, dt. 11-2-99 and 40/99-CE, dt. 2-11-99.

In exercise of the powers conferred by sub-section (1) of section 5A of the Central Excises and Salt Act, 1944 (1 of 1944) read with sub-section (3) of section 3 of the Additional Duties of Excise (Goods of Special Importance) Act, 1957 (58 of 1957), the Central Government, being satisfied that it is necessary in the public interest so to do, hereby exempts all goods falling under the Schedule to the Central Excise Tariff Act, 1985 (5 of 1986) (hereinafter referred to as the said goods) when supplied to the United Nations or an international organisation for their official use or supplied to the projects financed by the said United Nations or an international organisation and approved by the Government of India, from the whole of-

(i) the duty of excise leviable thereon under section 3 of the Central Excises Act, 1944 (1 of 1944); and

(ii) the additional duty of excise leviable thereon under sub-section (1) of section 3 of the Additional Duties of Excise (Goods of Special Importance) Act, 1957 (58 of 1957):

Provided that before clearance if the said goods, the manufacturer produces before the Assistant Commissioner of Central Excise having jurisdiction over his factory :-

(a) in case the said goods are intended for the official use by the United Nations or an international organisation, a certificate from the United Nations or that international organisation that the said goods are intended for such use;

(b) in case of the said goods are-

(i) Supplied to an international organisation listed in the Annexure appended to this notification for use in a project that has been approved by the Government of India and financed (whether by a loan or a grant) by such an organisation, a certificate from such an organisation that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India; or

(ii) Supplied to a project that has been approved by the Government of India and financed (whether by a loan or a grant) by an international organisation listed in the said annexure, a certificate from an officer not below the rank of Deputy Secretary to the Government of India, in the Ministry of finance (Department of Economic Affairs) that the said goods are required for the execution of the said project and that the said project has duly been approved by the government of India;

(Above b) i & ii have been substituted vide Cen Exc NTF 40/99 dt. 2-11-99)

(c) in case the said goods are intended to be supplied to a project financed (whether by a loan or a grant) by the World Bank, the Asian Development Bank or any international organisation, other than those listed in the

Annexure, and

(Above c) has been amended vide Cen Exc NTF 40/99 dt. 2-11-99)

(i) if the said project has been approved by the Government of India, a certificate from the executive head of the Project Implementing Authority and countersigned by an officer not below the rank of a Joint Secretary to the Government of India, in the concerned Line Ministry in the Government of India, that the said goods are required for the execution of the said project and that the said project has duly been approved by the Government of India, and

(ii) if the said project has been approved by the Government of India for implementation by the Government of a State or a Union Territory, a certificate from the executive head of the Project Implementing Authority and countersigned by the Principal Secretary or the Secretary (Finance), as the case may be, in the concerned State Government or the Union Territory, that the said goods are required for the execution of the said project, and that the said project has duly been approved by the Government of India for implementation by the concerned State Government.

(Above proviso has been amended vide Central Excise Notification No. 4/99 dt. 11-2-99)

Explanation.-For the purpose of this notification,-

(a) "international organisation" means an international organisation to which the Central Government has declared, in pursuance of section 3 of the United Nations (Privileges and Immunities) Act, 1947 (46 of 1947), that the provisions of the Schedule to the said Act shall apply;

(b) "Line Ministry" means a Ministry in the Government of India, which has been so nominated with respect to a project, by the Government of India, in the Ministry of Finance (Department of Economic Affairs).'

(Above explanation has been amended vide Central Exicse Notification No. 4/99 dt. 11-2-99)

ANNEXURE

1. United Nations Development Progremme,

2. United Nations International Childrens' Fund,

3. Food and Agricultural Organisation,

4. International Labour Organisation,

5. World health Organisation,

6. United Nations Population Fund.

7. United Nations World Food Programme

8. United Nations Industrial Development Organisation.

(Above Sl. No. (8.) has been inserted vide Ntf. No. 50/2001-CE, dt. 12-10-2001)

(Above Sl. No. (7.) has been inserted vide Ntf. No. 36/2001-CE, dt. 6-7-2001)

(Above ANNEXURE has been added vide Cen NTF 40/99 dt. 2-11-99)

(Note:-see Ntf. No. 31/2001-CE(NT), dt. 21/06/2001)

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, Dated: 06.10.2010

In exercise of the powers conferred by section 9 of the Rajasthan Tax on Entry of Goods into Local Areas Act, 1999 (Act No. 13 of 1999), the State Government being of the opinion that it is expedient in the public interest so to do, hereby exempts from payment of tax payable under the said Act by any registered dealer on goods and equipments mentioned in Annexure-A of this notification, which are brought into the local area for exclusive use in execution of works contracts related to Metro Rail project in Jaipur City awarded by the Delhi Metro Rail Corporation Limited for Jaipur Metro Rail Project on the condition that such dealer shall submit a declaration to the assessing authority, in the form as specified in Annexure-'B' of this notification duly certified by the authorized officer of the Delhi Metro Rail Corporation Limited.

ANNEXURE-'A'

List of goods required for execution of Metro Rail Project in Jaipur City

S.No.	Name of Goods	S.No.	Name of Goods
1.	Cement	10.	Marble/granite/tiles/ kota stone
2.	Steel (a) TOR, TMT (b) HTS (c) Binding wire (d) Plate, structural Steel (i) Angle (ii) Channel (iii) SMB etc. (iv) Pipe	11.	Sanitary fitting/wares
3.	Aggregate	12.	Sheet AC/GI/others
4.	Sand	13.	Paver block/ CC blocks
5.	Ply	14.	Bitumen
6.	Batten- wooden	15.	Stainless steel pipe/hollow section
7.	Hardware -Nail etc	16.	Paint/snow-cem/putty etc
8.	Bearing i. Neoprene ii.Pot /PTFE	17.	Diesel/petrol
9.	Bentonite	18.	Tyre

19.	Ready mix concrete	26.	Spare part of 4 wheeler dumper, Tractor, Crane, Gantry
20.	Jacks	27.	Electrical cable/ fitting
21.	GI/CI/PVC/SW Pipes	28.	Signal& telecom cable & fittings equipments
22.	JCB, excavator, loader, truck, Car, Jeep, dumper, tractor, trailer, cranes, battery plant, concrete pump, placcer, transit mixer, gantry, launchings girder, piling rig	29	Rail
23.	Bricks/stone	30.	PSC sleeper, CI inserts
24.	Aluminum	31.	Track fittings: - Points and crossing, pandrol clip, rubber pad, liner
25.	Wooden/ply doors	32.	Ballast

List of electrical equipment:

1. **25 Km. (S.P.) AC. Traction:** All equipment used for erecting of overhead (25 KV - A.C. traction System including. Contact wire, centenary wire, Droppers, Insulators, Masts, Portals, Drop Arm, Steel structures, Automatic Tensioning Device, Traction Return Rail Bonding, Earthing System etc.
2. **Power & Distribution transformers:** 220/132 KV, 132/33 KV, 33 KV /25 KV - Power 33/0.415 Aux.transformers, Booster transformers etc.
3. **Sub Stations:** All the equipments installed in substation including single Bus Bar with Bus sectioning or Double Bus Bar with Bus coupler, circuit breakers, interrupters (220 KV, 132 KV, 25 KV single phase) for traction load and 33 KV side for Auxiliary loads, lightening protection equipment, Instrument transformers (current & Voltage), Protection Relays etc.
4. **H.T. & L.T. Cables :** All cables used for connecting the Equipments in the above stated system for operation & control.
5. **Stand By arrangement:** A) D.G. Set. 200 KVA at elevated Stations, D.G. Set. 2x1000/750 KVA at U.G. Station (chandpole)
   (B) Battery Chargers with Batteries for control supply.
6. Equipments used in supervisory control & Data Acquisition (SCADA) system with Optical Fibre Glass Cables.
7. All the Equipment used in Ventilation & Air Conditioning System.
8. Equipments used for Illumination.
9. Equipments used for provision of Fans.
10. Equipments used for provision of exhaust fans.
11. Equipments used for provision of Escalators/Lifts.
12. Equipments used for provision of Pump Sets.
13. Equipments required for cool drinking water.
14. Equipments for provision of Sign age on P.F & Sin Bldg's

ANNEXURE-'B'

DECLARATION FOR GOODS BROUGHT INTO LOCAL AREA

No. Dated:

To,
.....
.....
(Name of the assessing authority of the registered dealer)

It is hereby certified that the goods ..... brought by M/s .....into the local area vide invoice No..... dated.....for ₹..... (in words) ..... have been exclusively utilized in completion of Metro Rail Project in Jaipur City.

Seal

Signature of Authorized officer of DMRC
Name
Designation

[No. F.12(100) FD/Tax/10-81]
By Order of the Governor,

(Bhawani Singh Detha)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur for publication of this notification in part 4(c) of extra ordinary gazette along with a soft copy in CD. It is requested 10 copies of this notification may sent to this department and 20 copies along with bill may be sent Commissioner, Commercial Taxes Department Rajasthan, Jaipur, Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Principal Secretary, Law.
7. PS to Principal Secretary, LSG & UDH and Chairman & Managing Director, JMRC.
8. PS to Secretary, Finance (Revenue).
9. Director, Public Relations, Jaipur.
10. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
11. Guard File.

Deputy Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, dated December 8, 2011

In exercise of the powers conferred by section 9 of the Rajasthan Tax on Entry of Goods into Local Areas Act, 1999 (Act No.13 of 1999), the State Government being of the opinion that it is expedient in the public interest so to do, hereby makes the following amendments in this Department's notification number F.12(100)FD/Tax/2010-81 dated 06-10-2010, namely:-

AMENDMENTS

In the said notification,-

(i) for the existing expression "Delhi Metro Rail Corporation Limited" wherever occurring, the expression "Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited" shall be substituted.

(ii) the existing expression "of DMRC" appearing in Annexure "B", shall be deleted.

This shall have effect from 06-10-2010.

[No. F.12(100)FD/Tax/10 - 76]
By Order of the Governor,

(Mewa Ram Jat)
Dy. Secretary to Government

Copy forwarded to the following for information and necessary action:-

1. Superintendent, Government Central Press, Jaipur 2011 along with a soft copy in CD for publication of this notification in part 4(c) of today's extra ordinary Gazette. It is requested that 10 copies of this notification may be sent to this Department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Secretary, Finance (Revenue).
7. Director, Public Relations, Jaipur.
8. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
9. Guard File.

Dy. Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION
Jaipur, April 17 , 2013

In exercise of the powers conferred by section 9 of the Rajasthan Tax on Entry of Goods into Local Areas Act, 1999 (Act No.13 of 1999), the State Government being of the opinion that it is expedient in the public interest so to do hereby, with immediate effect, makes the following amendments in this Department's notification No.F.12 (100)FD/Tax/10-81 dated 06.10.2010, as amended from time to time, namely:-

AMENDMENTS

In the List of goods required for execution of Metro Rail Project in Jaipur City of Annexure 'A' of said notification.-

(i) the existing serial number 28 and entries thereto shall be substituted by the following, namely:-

"

28.	Equipments required for provision of Signaling, Telecommunication and Ticketing systems (including electronic, electrical & IT), Cables, Batteries, Equipments racks and UPS

"

(ii) after existing serial number 32 and entries thereto the following new serial number 33 and entries thereto shall be added, namely:-

"

33.	Rolling stock including Sub-assemblies, Components, Accessories and Spares thereof

"

[No. F.12 (100)FD/Tax/2010-10]
By Order of the Governor,

(Aditya Pareek)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur along with a soft copy in CD for publication of this notification in part 4(c) of extra ordinary gazette. It is requested that 10 copies of this notification may be sent to this department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy as provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, UDH & LSG.
6. PS to Principal Secretary, Finance.
7. PS to Secretary, Finance (Revenue).
8. Director, Public Relations, Jaipur.
9. SA (Joint Director), Finance (Computer Cell) Department, Secretariat, Jaipur.
10. Guard File.

Dy. Secretary to the Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, Dated:- 06-10-2010

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003 (Act No. 4 of 2003), the State Government being of the opinion that it is expedient in the public interest so to do, hereby exempts from payment of tax payable on purchases of taxable goods and equipments mentioned in annexure-'A' of this notification, made by any registered dealer for exclusive use in execution of works contracts related to Metro Rail Project in Jaipur City awarded by the Delhi Metro Rail Corporation Limited for Jaipur Metro Rail Project on the following conditions, namely:-

1. That the purchasing registered dealer has a valid contract with the Delhi Metro Rail Corporation Limited for execution of works contracts related to Metro Rail project in Jaipur City;
2. That the purchasing registered dealer shall ensure that the sale invoice of goods contains the expression "The goods purchased by this invoice have been purchased in pursuance to contract with Delhi Metro Rail Corporation Limited for exclusive use in the Jaipur Metro Rail Project";
3. That the purchasing registered dealer shall submit a monthly statement of such taxable purchases to his assessing authority within fifteen days from the close of the month; and
4. That the purchasing registered dealer shall submit a declaration to the selling dealer in the form specified in Annexure- 'B' of this notification, for every taxable purchase made by him, duly certified by the authorized officer of the Delhi Metro Rail Corporation Limited. Exemption from payment of tax on such sales made by the selling dealer shall be allowed only on furnishing of the said declaration to his assessing authority.

ANNEXURE-'A'

List of goods required for execution of Metro Rail Project in Jaipur City

S.No.	Name of Goods	S.No.	Name of Goods
1.	Cement	17.	Marble/granite/tiles/ kota stone
2.	Steel (a) TOR, TMT (b) HTS (c) Binding wire (d) Plate, structural Steel (i) Angle (ii) Channel (iii) SMB etc. (iv) Pipe	18.	Sanitary fitting/wares
3.	Aggregate	19.	Sheet AC/GI/others
4.	Sand	20.	Paver block/ CC blocks
5.	Ply	21.	Bitumen
6.	Batten- wooden	22.	Stainless steel pipe/hollow section
7.	Hardware -Nail etc	23.	Paint/snow-cem/putty etc
8.	Bearing i. Neoprene ii.Pot /PTFE	24.	Diesel/petrol
9.	Bentonite	25.	Tyre
10.	Ready mix concrete	26.	Spare part of 4 wheeler dumper, Tractor, Crane, Gantry
11.	Jacks	27.	Electrical cable/ fitting
12.	GI/CI/PVC/SW Pipes	28.	Signal& telecom cable & fittings equipments
13.	JCB, excavator, loader, truck, Car, Jeep, dumper, tractor, trailer, cranes, battery plant, concrete pump, placcer, transit mixer, gantry, launchings girder, piling rig	29	Rail
14.	Bricks/stone	30.	PSC sleeper, CI inserts
15.	Aluminum	31.	Track fittings: - Points and crossing, pandrol clip, rubber pad, liner
16.	Wooden/ply doors	32.	Ballast

List of electrical equipment:

1. **25 Km. (S.P.) AC. Traction:** All equipment used for erecting of overhead (25 KV -A.C. traction System including. Contact wire, centenary wire, Droppers, Insulators, Masts, Portals, Drop Arm, Steel structures, Automatic Tensioning Device, Traction Return Rail Bonding, Earthing System etc.

2. **Power & Distribution transformers:** 220/132 KV, 132/33 KV, 33 KV /25 KV - Power 33/0.415 Aux.transformers, Booster transformers etc.

3. **Sub Stations:**All the equipments installed in substation including single Bus Bar with Bus sectioning or Double Bus Bar with Bus coupler, circuit breakers, interrupters (220 KV, 132 KV, 25 KV single phase) for traction load and 33 KV side for Auxiliary loads, lightening protection equipment, Instrument transformers (current & Voltage), Protection Relays etc.

4. **H.T. & L.T. Cables :** All cables used for connecting the Equipments in the above stated system for operation & control.

5. **Stand By arrangement:** A) D.G. Set. 200 KVA at elevated Stations, D.G. Set. 2x1000/750 KVA at U.G. Station (chandpole)

B) Battery Chargers with Batteries for control supply.

6. Equipments used in supervisory control & Data Acquisition (SCADA) system with Optical Fibre Glass Cables.

7. All the Equipment used in Ventilation & Air Conditioning System.

8. Equipments used for Illumination.

9. Equipments used for provision of Fans.

10. Equipments used for provision of exhaust fans.

11. Equipments used for provision of Escalators/Lifts.

12. Equipments used for provision of Pump Sets.

13. Equipments required for cool drinking water.

14. Equipments for provision of Sign age on P.F & Sin Bldg's

ANNEXURE-'B'

DECLARATION FOR PURCHASE OF GOODS

To,

.....

.....

(Name and complete address of the seller)

I/We hereby declare that the goods.....ordered vide our order No.....dated.....and purchased from you as per your VAT Invoice No..... dated.....for ₹ ..... (in words) ..... have been purchased in pursuance to contract with Delhi Metro Rail Corporation Limited for exclusive use in the Jaipur Metro Rail Project

Seal

Signature
Name
TIN

Certification to be made by the authorized officer of the Delhi Metro Rail Corporation limited

No. Dated:

It is hereby certified that the goods mentioned above have been utilized in completion of Metro Rail Project in Jaipur City.

Seal

Signature of Authorized officer of DMRC
Name
Designation

[No. F.12(100) FD/Tax/10- 78]
By Order of the Governor,

(Bhawani Singh Detha)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur for publication of this notification in part 4(c) of extra ordinary gazette along with a soft copy in CD. It is requested 10 copies of this notification may sent to this department and 20 copies along with bill may be sent Commissioner, Commercial Taxes Department Rajasthan, Jaipur, Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Principal Secretary, Law.
7. PS to Principal Secretary, LSG & UDH and Chairman & Managing Director, JMRC .
8. PS to Secretary, Finance (Revenue).
9. Director, Public Relations, Jaipur.
10. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
11. Guard File.

Deputy Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, dated December 8, 2011

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003 (Act No. 4 of 2003), the State Government being of the opinion that it is expedient in the public interest so to do, hereby makes the following amendments in this Department's notification number F.12(100)FD/Tax/2010-78 dated 06-10-2010, namely:-

AMENDMENTS

In the said notification,-

(i) for the existing expression "Delhi Metro Rail Corporation Limited" wherever occurring, the expression "Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited " shall be substituted.

(ii) the existing expression "of DMRC" appearing in Annexure "B", shall be deleted.

This shall have effect from 06-10-2010.

[No. F.12(100)FD/Tax/10 -73]
By Order of the Governor,

(Mewa Ram Jat)
Dy. Secretary to Government

Copy forwarded to the following for information and necessary action:-

1. Superintendent, Government Central Press, Jaipur 2011 along with a soft copy in CD for publication of this notification in part 4(c) of today's extra ordinary Gazette. It is requested that 10 copies of this notification may be sent to this Department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Secretary, Finance (Revenue).
7. Director, Public Relations, Jaipur.
8. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
9. Guard File.

Dy. Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION
Jaipur, April 24 , 2013

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003, (Act No. 4 of 2003), the State Government being of the opinion that it is expedient in the public interest so to do hereby, with immediate effect, makes the following amendments in this Department's notification No.F.12(100)FD/Tax/10-78 dated 06.10.2010, as amended from time to time, namely:-

AMENDMENTS

In the List of goods required for execution of Metro Rail Project in Jaipur City of Annexure 'A' of said notification.-

(i) the existing serial number 28 and entries thereto shall be substituted by the following, namely:-

"

28.	Equipments required for provision of Signaling, Telecommunication and Ticketing systems (including electronic, electrical & IT), Cables, Batteries, Equipments racks and UPS

"

(ii) after existing serial number 32 and entries thereto the following new serial number 33 and entries thereto shall be added, namely:-

"

33.	Rolling stock including Sub-assemblies, Components, Accessories and Spares thereof

"

[No. F.12(100)FD/Tax/10-11]
By Order of the Governor,

(Aditya Pareek)
Deputy Secretary to the Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur along with a soft copy in CD for publication of this notification in part 4(c) of **today's extra ordinary Gazette**. It is requested that 10 copies of this Notification may be sent to this department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy as provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, UDH & LSG.
6. PS to Principal Secretary, Finance.
7. PS to Principal Secretary, Law
8. PS to Secretary, Finance (Revenue).
9. Director, Public Relations, Jaipur.
10. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
11. Guard File.

Deputy Secretary to the Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION
Jaipur, dated : February 08, 2016

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003 (Act No.4 of 2003), the State Government being of the opinion that it is expedient in public interest so to do, hereby, with effect from 01.01.2016, makes the following amendments in this department's notification number F.12(100)FD/Tax/10-78 dated 06.10.2010, as amended from time to time, namely :-

Amendments

In the said notification,-

(i) the existing condition 4 shall be substituted by the following, namely:-
"That the purchasing registered dealer shall generate a declaration in Form VAT-72 electronically through the official website of the Commercial Taxes Department, in the manner as provided therein and furnish a duly signed copy of Form VAT-72 so generated, to the selling dealer along with the duly filled in and signed certificate of the authorized officer of the Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited, as provided in ANNEXURE-B appended hereto."; and

(ii) the existing Annexure-B appended to the said notification shall be substituted by the following, namely:-

"ANNEXURE-B

Certificate to be made by the authorized officer of the Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited

No. Dated:

It is hereby certified that the goods mentioned in Form VAT-72 No. ..... generated by M/S. .....have been utilized in completion of Metro Rail Project in Jaipur City.

Seal

Signature of Authorized officer of DMRC:
Name:
Designation:....."

[F.12(79)FD/Tax/2014-Pt-I-151]
By order of the Governor,
08/02/16

(Dr. Devraj)
Joint Secretary to the Government

Copy forwarded to the following for information and necessary action:-

1. Superintendent, Government Central Press, Jaipur along with a soft copy in CD for publication of this notification in part 4(c) of **today's extra ordinary Gazette**. It is requested that 10 copies of this notification may be sent to this Department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to Principal Secretary, Finance.
6. PS to Principal Secretary, Law.
7. PS to Secretary, Finance (Revenue).
8. Director, Public Relations, Jaipur.
9. Additional Director, Finance (Computer Cell) Department for uploading the notification on website of Finance Department.
10. Guard File.

08/02/16

Joint Secretary to the Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, Dated: 06-10-2010

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003 (Act No. 4 of 2003), the State Government being of the opinion that it is expedient in the public interest so to do, hereby exempts from payment of tax payable by any registered dealer on transfer of property in goods involved in execution of works contracts related to Metro Rail project in Jaipur City awarded by the Delhi Metro Rail Corporation Limited for Jaipur Metro Rail Project.

[No. F.12(100) FD/Tax/10- 79]
By Order of the Governor,

(Bhawani Singh Detha)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur for publication of this notification in part 4(c) of extra ordinary gazette along with a soft copy in CD. It is requested 10 copies of this notification may sent to this department and 20 copies along with bill may be sent Commissioner, Commercial Taxes Department Rajasthan, Jaipur, Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Principal Secretary, Law.
7. PS to Principal Secretary, LSG & UDH and Chairman & Managing Director, JMRC .
8. PS to Secretary, Finance (Revenue).
9. Director, Public Relations, Jaipur.
10. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
11. Guard File.

Deputy Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, dated December 8, 2011

In exercise of the powers conferred by sub-section (3) of section 8 of the Rajasthan Value Added Tax Act, 2003 (Act No.4 of 2003), the State Government being of the opinion that it is expedient in the public interest so to do, hereby makes the following amendment in this Department's notification number F.12(100)FD/Tax/2010-79 dated 06-10-2010, namely:-

AMENDMENT

In the said notification, after the existing expression "awarded by the" and before the existing expression "Delhi Metro Rail Corporation Limited", the expression "Jaipur Metro Rail Corporation Ltd. or the" shall be inserted.

This shall have effect from 06-10-2010.

[No. F.12(100)FD/Tax/10 -74]
By Order of the Governor,

(Mewa Ram Jat)
Dy. Secretary to Government

Copy forwarded to the following for information and necessary action:-

1. Superintendent, Government Central Press, Jaipur 2011 along with a soft copy in CD for publication of this notification in part 4(c) of today's extra ordinary Gazette. It is requested that 10 copies of this notification may be sent to this Department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Secretary, Finance (Revenue).
7. Director, Public Relations, Jaipur.
8. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
9. Guard File.

Dy. Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

Jaipur, Dated: 11.8.2006

In pursuance of clause (3) of Article 348 of the Constitution of India, the Governor is pleased to authorize the publication of this Notification No F.12(63)FD/Tax/2005-81 dated 11.8.2006, in English language, in the Rajasthan Gazette of Finance (Tax) Department.

By Order of the Governor,

(Arun Gupta)
Deputy Secretary to Government

NOTIFICATION

Jaipur, Dated: 11.8.2006

In exercise of the powers conferred by sub-section (2) of section 20 of the Rajasthan Value Added Tax Act, 2003 (Act No. 4 of 2003), read with sub-rule (2) of rule 40 of the Rajasthan Value Added Tax Rules, 2006, the State Government hereby notifies that the awarder or any person authorised by him, at the time of credit of any sum to the account of the contractor or at the time of making such payment by any mode, for carrying out any work, shall deduct, in lieu of tax, an amount equal to 3% of such sum:

Provided that in case of contractors having exemption certificate under notification No. F.12(63)FD/Tax/2005-80 dated 11.8.2006, the awarder or any person authorised by him shall deduct in lieu of tax an amount equal to rate of exemption fee as mentioned in the said exemption certificate.

[No.F.12(63)FD/Tax/2005-81]
By Order of the Governor,

(Arun Gupta)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur for publication of this notification in part 4(c) of extra ordinary gazette. 10 copies of this notification may sent to this department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department Raj. Jaipur.
2. Principal Secretary to Chief Minister (Finance Minister).
3. PS to Chairman, Rajasthan VAT Grievances Redressel Committee, Jaipur.
4. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
5. PS to Principal Secretary, Finance.
6. PS to Secretary, Finance (II).
7. PS to Director, Public Relations Jaipur.
8. ACP, Finance Department, Secretariat, Jaipur.
9. Guard file.

Deputy Secretary to Government

GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, Dated: 06.10.2010

In exercise of the powers conferred by sub-section (2) of section 20 of the Rajasthan Value Added Tax Act, 2003 (Act No. 4 of 2003), read with sub-rule (2) of rule 40 of the Rajasthan Value Added Tax Rules, 2006, the State Government hereby makes the following amendment in this department's notification No.F.12(63) FD/Tax/ 2005-81 dated 11.08.2006, as amended from time to time, namely:-

AMENDMENT

In the said notification, after the existing last proviso, the following new proviso shall be added, namely:-

"Provided further that in case of works contracts related to Metro Rail Project in Jaipur City awarded by the Delhi Metro Rail Corporation Limited for Jaipur Metro Rail Project, no amount in lieu of tax shall be deducted by the Delhi Metro Rail Corporation Limited or any person authorized by him."

[No. F.12(100) FD/Tax/10-80]
By Order of the Governor,

(Bhawani Singh Detha)
Deputy Secretary to Government

Copy forwarded to the following for information and necessary action:

1. Superintendent, Government Central Press, Jaipur for publication of this notification in part 4(c) of extra ordinary gazette along with a soft copy in CD. It is requested 10 copies of this notification may sent to this department and 20 copies along with bill may be sent Commissioner, Commercial Taxes Department Rajasthan, Jaipur, Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Principal Secretary, Law.
7. PS to Principal Secretary, LSG & UDH and Chairman & Managing Director, JMRC.
8. PS to Secretary, Finance (Revenue).
9. Director, Public Relations, Jaipur.
10. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
11. Guard File.

Deputy Secretary to Government

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GOVERNMENT OF RAJASTHAN
FINANCE DEPARTMENT
(TAX DIVISION)

NOTIFICATION

Jaipur, dated December 8, 2011

In exercise of the powers conferred by sub-section (2) of section 20 of the Rajasthan Value Added Tax Act, 2003 (Act No.4 of 2003), read with sub-rule (2) of rule 40 of the Rajasthan Value Added Tax Rules, 2006, the State Government being of the opinion that it is expedient in the public interest so to do, hereby makes the following amendment in this Department's notification number F.12(63)FD/Tax/2005-81 dated 11-08-2006, as amended from time to time, namely:-

AMENDMENT

In the said notification, the existing last proviso shall be substituted by the following, namely:-

"Provided further that in case of works contracts related to Metro Rail Project in Jaipur City awarded by the Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited for Jaipur Metro Rail Project, no amount in lieu of tax shall be deducted by the Jaipur Metro Rail Corporation Ltd. or Delhi Metro Rail Corporation Limited or any person authorized by them."

This shall have effect from 06-10-2010.

[No. F.12(100)FD/Tax/10 -75]
By Order of the Governor.

(Mewa Ram Jat)
Dy. Secretary to Government

Copy forwarded to the following for information and necessary action:-

1. Superintendent, Government Central Press, Jaipur 2011 along with a soft copy in CD for publication of this notification in part 4(c) of today's extra ordinary Gazette. It is requested that 10 copies of this notification may be sent to this Department and 20 copies along with bill may be sent to Commissioner, Commercial Taxes Department, Rajasthan, Jaipur. Please ensure that soft copy in CD is same as hard copy provided to you for publication.
2. Principal Secretary to Hon'ble Chief Minister (Finance Minister).
3. Commissioner, Commercial Taxes Department, Rajasthan, Jaipur.
4. Accountant General, Rajasthan, Jaipur.
5. PS to ACS, Finance.
6. PS to Secretary, Finance (Revenue).
7. Director, Public Relations, Jaipur.
8. SA, Finance (Computer Cell) Department, Secretariat, Jaipur.
9. Guard File.

Dy. Secretary to Government

[TO BE PUBLISHED IN THE GAZETTE OF INDIA, EXTRAORDINARY, PART II, SECTION 3, SUB-SECTION (i)]

GOVERNMENT OF INDIA
MINISTRY OF FINANCE
(DEPARTMENT OF REVENUE)
NOTIFICATION
No.9/2016-Service Tax,

New Delhi, the 1st March, 2016

G.S.R.….(E).-In exercise of the powers conferred by sub-section (1) of section 93 of the Finance Act, 1994 (32 of 1994), the Central Government being satisfied that it is necessary in the public interest so to do, hereby makes the following further amendments in the notification of the Government of India in the Ministry of Finance (Department of Revenue) No.25/2012-Service Tax, dated the 20thJune, 2012, published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i) *vide* number G.S.R. 467 (E), dated the 20thJune, 2012, namely:-

1. In the said notification,-

(a) in the first paragraph,-

(i) in entry 6, for clause (b) and clause (c), the following clauses shall be substituted, namely,-

"(b) a partnership firm of advocates or an individual as an advocate other than a senior advocate, by way of legal services to-

(i) an advocate or partnership firm of advocates providing legal services;

(ii) any person other than a business entity; or

(iii) a business entity with a turnover up to rupees ten lakh in the preceding financial year; or

(c) a senior advocate by way of legal services to a person other than a person ordinarily carrying out any activity relating to industry, commerce or any other business or profession;";

(ii) after entry 9A, the following entry shall be inserted with effect from 1st March, 2016, namely,-

"9B. Services provided by the Indian Institutes of Management, as per the guidelines of the Central Government, to their students, by way of the following educational programmes, except Executive Development Programme, -

(a) two year full time residential Post Graduate Programmes in Management for the Post Graduate Diploma in Management, to which admissions are made on the basis of Common Admission Test (CAT), conducted by Indian Institute of Management;
(b) fellow programme in Management;
(c) five year integrated programme in Management.";

(iii) after entry 9B as so inserted, the following entries shall be inserted, namely:-

"9C. services of assessing bodies empanelled centrally by Directorate General of Training, Ministry of Skill Development and Entrepreneurship by way of assessments under Skill Development Initiative (SDI) Scheme;

9D. services provided by training providers (Project implementation agencies) under Deen Dayal Upadhyaya Grameen Kaushalya Yojana under the Ministry of Rural Development by way of offering skill or vocational training courses certified by National Council For Vocational Training.";

(iv) after entry 12, with effect from the 1st March, 2016, the following entry shall be inserted, namely-

"12A. Services provided to the Government, a local authority or a governmental authority by way of construction, erection, commissioning, installation, completion, fitting out, repair, maintenance, renovation, or alteration of -

(a) a civil structure or any other original works meant predominantly for use other than for commerce, industry, or any other business or profession;

(b) a structure meant predominantly for use as (i) an educational, (ii) a clinical, or(iii) an art or cultural establishment; or

(c) a residential complex predominantly meant for self-use or the use of their employees or other persons specified in the Explanation 1 to clause (44) of section 65 B of the said Act;

under a contract which had been entered into prior to the 1st March, 2015 and on which appropriate stamp duty, where applicable, had been paid prior to such date:

provided that nothing contained in this entry shall apply on or after the 1st April, 2020;";

(v) in entry 13, after item (b), the following items shall be inserted with effect from 1st March, 2016, namely –

"(ba) a civil structure or any other original works pertaining to the 'In-situ rehabilitation of existing slum dwellers using land as a resource through

private participation'under the Housing for All (Urban) Mission/Pradhan Mantri Awas Yojana, only for existing slum dwellers.

(bb) a civil structure or any other original works pertaining to the 'Beneficiary-led individual house construction / enhancement under the Housing for All (Urban) Mission/Pradhan Mantri Awas Yojana;";

(vi) in entry 14, with effect from 1st March, 2016,

A. for item (a), the following shall be substituted, namely:-

"(a) railways, excluding monorail and metro;

Explanation.-The services by way of construction, erection, commissioning or installation of original works pertaining to monorail or metro, where contracts were entered into before 1st March, 2016, on which appropriate stamp duty, was paid, shall remain exempt.".

B. after item (c), the following item shall be inserted, namely –

"(ca) low cost houses up to a carpet area of 60 square metres per house in a housing project approved by the competent authority under:
(i) the "Affordable Housing in Partnership" component of the Housing for All (Urban) Mission/Pradhan Mantri Awas Yojana;
(ii) any housing scheme of a State Government.".

(vii) after entry 14, with effect from the 1st March, 2016, the following entry shall be inserted, namely-

"14A. Services by way of construction, erection, commissioning, or installation of original works pertaining to an airport or port provided under a contract which had been entered into prior to 1st March, 2015 and on which appropriate stamp duty, where applicable, had been paid prior to such date:

provided that Ministry of Civil Aviation or the Ministry of Shipping in the Government of India, as the case may be, certifies that the contract had been entered into before the 1st March, 2015:

provided further that nothing contained in this entry shall apply on or after the 1st April, 2020;";

(viii) in entry 16, for the words "one lakh rupees", the words "one lakh and fifty thousand rupees" shall be substituted;

(ix) in entry 23,-

(A) after clause (b), the following clause shall be inserted with effect from 1st June 2016, namely,-

"(bb) stage carriage other than air-conditioned stage carriage;";

(B) clause (c) shall be omitted;

(x) in entry 26, after clause (p), the following clause shall be inserted, namely,-

"(q) Niramaya' Health Insurance Scheme implemented by Trust constituted under the provisions of the National Trust for the Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, 1999 (44 of 1999).";

(xi) after entry 26B, the following entry shall be inserted, namely,-

"26C. Services of life insurance business provided by way of annuity under the National Pension System regulated by Pension Fund Regulatory and Development Authority of India (PFRDA) under the Pension Fund Regulatory And Development Authority Act, 2013 (23 of 2013);";

(xii) after entry 48, the following entries shall be inserted, namely,-

"49. Services provided by Employees' Provident Fund Organisation (EPFO) to persons governed under the Employees' Provident Funds and Miscellaneous Provisions Act, 1952 (19 of 1952);

50. Services provided by Insurance Regulatory and Development Authority of India (IRDA) to insurers under the Insurance Regulatory and Development Authority of India Act, 1999 (41 of 1999);

51. Services provided by Securities and Exchange Board of India (SEBI) set up under the Securities and Exchange Board of India Act, 1992 (15 of 1992) by way of protecting the interests of investors in securities and to promote the development of, and to regulate, the securities market;

52. Services provided by National Centre for Cold Chain Development under Ministry of Agriculture, Cooperation and Farmer's Welfare by way of cold chain knowledge dissemination;";

(xiii) after entry 52 as so inserted, the following entries shall be inserted with effect from 1st June 2016, namely:-

"53. Services by way of transportation of goods by an aircraft from a place outside India upto the customs station of clearance in India.";

(b) in paragraph 2, -

(i) after clause (b), the following clause shall be inserted with effect from such date on which the Finance Bill, 2016 receives assent of the President of India, namely: -

'(ba) "approved vocational education course" means, -

(i) a course run by an industrial training institute or an industrial training centre affiliated to the National Council for Vocational Training or State Council for Vocational Training offering courses in designated trades notified under the Apprentices Act, 1961 (52 of 1961); or

(ii) a Modular Employable Skill Course, approved by the National Council of Vocational Training, run by a person registered with the Directorate General of Training, Ministry of Skill Development and Entrepreneurship;';

(ii) for clause (oa), the following shall be substituted with effect from such date on which the Finance Bill, 2016, receives assent of the President of India, namely : -

'(oa) "educational institution" means an institution providing services by way of:

(i) pre-school education and education up to higher secondary school or equivalent;

(ii) education as a part of a curriculum for obtaining a qualification recognised by any law for the time being in force;

(iii) education as a part of an approved vocational education course;";

(iii) after clause (zd), the following clause shall be inserted, namely:-

'(zdd) "senior advocate' has the meaning assigned to it in section 16 of the Advocates Act, 1961 (25 of 1961);'

2. Save as otherwise provided in this notification, this notification shall come into force on the 1st of April, 2016.

[F. No.334/8/2016 -TRU]

(K. Kalimuthu)
Under Secretary to the Government of India

Note:-The principal notification was published in the Gazette of India, Extraordinary, *vide* notification No. 25/2012 - Service Tax, dated the 20th June, 2012, *vide* number G.S.R. 467 (E), dated the 20thJune, 2012 and last amended *vide* notification number 07/2016 - Service Tax, dated the 18th February, 2016 *vide* number G.S.R. 184(E), dated the 18th February, 2016.

Annexure-II

(SN. 32 of PCC)

(To be stamped in accordance with Stamp Act)

INDENTURE FOR STAGE PAYMENT

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 Jaipur Metro Rail Corporation Ltd. (hereinafter called JMRC of the other part.

WHEREAS by the agreement (LOA No …….. dated……) (hereinafter called the said agreement) the contractor has agreed to "Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India" and whereas the contractor has applied to the JMRC Ltd. 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 JMRC Ltd. 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 JMRC Ltd 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 JMRC Ltd (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 JMRC Ltd and declare as follows:

1. That the said sum of Rs. ---------- (Rupees ---------- only) so Stage Payment by the JMRC Ltd 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 JMRC Ltd 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 JMRC Ltd 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 / JMRC Ltd 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 JMRC Ltd 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/JMRC Ltd. 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/JMRC Ltd.

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 JMRC Ltd., 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 JMRC 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 JMRC Ltd., 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 owning 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 Jaipur Metro Rail Corporation Limited, Khanij Bhawan, Tilak Marg, C-Scheme, Jaipur (Rajasthan), India, PIN–302 005. (Client) and …… (Contractor).

IN WITNESS where of the said contractor and by the order under the direction of JMRC Ltd 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 JMRC LTD IN THE PRESENCE OF:

SIGNATURE:

WITNESS

(NAME AND ADDRESS)

Annexure-III

CHECKLIST FOR BIDDERS QUALIFICATION SUBMISSION
(To be attached with Technical Bid submission)

SN	Reference to the Bid	Description of Item	Submitted		Submitted on page no
			YES	NO	
1	BDS clause 20.1	Submission has "ORIGINAL" and Two true copies of the same.			
2	Section-4 Vol-I	Letter of Technical Bid			
3	ITB-19.1 & Section-4 Vol-I	Bid security as per applicable format			
4		Banks detail for bid security			
5	ITB-3	Undertaking for Corrupt & Fraudulent Practice			
6	BDS clause 11.2 (g)	Tender index			
7	ITB-4	In case of single entity, articles of incorporation or constitution of the legal entity in accordance with ITB 4.1 and ITB 4.2			
8	ITB-20.2	Authorization to represent the firm or Joint Venture in accordance with ITB 22.2			
9	ITB-4.1	In case of Joint Venture, letter of intent to form Joint Venture or Joint Venture agreement.			
10	BDS clause 20.2	Memorandum of Understanding in case of JV/Consortium/Partnership			
11		Power of Attorney having the specimen signature of authorized signatory duly notarized.			
12		Board of Resolution or delegation of authorization for the concerned PoA.			
13		Article of Incorporation of Applicant JV/Consortium partners.			
14		Notes: (i) In case of Foreign Partner(s), Power of Attorney(s)and Board of Resolution confirming authority on the person(s) issuing the Power of Attorney for such actions, shall be submitted **duly notarized by the notary public of origin**			

15		(ii) In the case of government-owned enterprise, documents establishing legal and financial autonomy and compliance with commercial law, in accordance with ITB 4.5			
16	BDF Section-4 Vol. I	Form PER-I Proposed Personnel			
17	BDF Section-4 Vol. I	Form PER-II Resume of proposed personnel			
18	BDF Section-4 Vol. I	Form EQU: Equipment			
19	BDF Section-4 Vol. I	Technical Proposal			
20	BDF Section-4 Vol. I	Form ELI - 1: Bidder's Information Sheet			
21	BDF Section-4 Vol. I	Form ELI - 2: Joint Venture Information Sheet			
22	BDF Section-4 Vol. I	Form LIT – 1: Pending Litigation and Arbitration			
23	BDF Section-4 Vol. I	Form FIN - 1: Historical Financial Performance			
24	BDF Section-4 Vol. I	Form FIN - 2: Average Annual Construction Turnover			
25	BDF Section-4 Vol. I	Form FIN – 3: Availability of Financial Resources			
26	BDF Section-4 Vol. I	Form FIN- 4: Financial Resources Requirement			
27	BDF Section-4 Vol. I	Form FIN - 5: Compliance Check of Financial Resources			
28	BDF Section-4 Vol. I	Form EXP – 1: Contracts of Similar Size and Nature			
29	BDF Section-4 Vol. I	Form EXP - 2: Construction Experience in Key Activities			
30		Details regarding Letter of Acceptance/Work completion certificates /taking over certificates to substantiate the experience details filled in from EXP-1, EXP-2.			
31		Successfully or substantially completed certificates successfully from client clearly indicating the nature/scope of work, actual completion cost and actual date of completion for such work should be submitted			
32		In case the work is executed for private client, copy of work order, bill of quantities, bill wise details of			

		payment received certified by Chartered Accountant under his signature, stamp and membership number, Tax Deducted at Source (TDS) certificates for all payments received and copy of final/last bill paid by client shall be submitted.			
33		Technical submission in PDF format in a CD.			
34	BDF Section-4 Vol. I	Requirements for Bidder's Technical Proposals as per Section 4			
35	Section 6 of ER & BDF Section-4 Vol.I	Detail of equipment requirements as per item as per Item no.5 & Form EQU in section 4 BDF			
36	Section 6 ER & BDF Section-4 Vol. I	Project Organization as per item no. 7 Section 6 and PER - I & II of Section 4			
37	Section 6 ER	Outline Quality Plan			
38	Section 6 ER	Outline Safety, Health & Environment Plan			
39		The supporting documents /printed literature are translated in English language and is duly certified by the authorized signatory			
40		Each page of the submittal has been numbered, signed and stamped by authorized signatory.			

Undertaking

This is to undertake that I have checked the above list with our submittal. I am also aware that if the application is not containing the above documents, our application is liable to be rejected.

Authorized Signatory

Annexure-IV

CHECKLIST FOR BIDDERS QUALIFICATION SUBMISSION
(To be attached with Financial Bid submission)

SN	Reference to the Bid	Description of Item	Submitted		Submitted on page no
			YES	NO	
1	BDS clause 20.1	Submission has "ORIGINAL" and Two true copies of the same.			
2	BDF Section-4 Vol. I	Letter of Price Bid			
3	Section 6 of ER	Pricing of Unqualified Withdrawal of Conditions, Qualifications, Deviations, etc if any			
4	BDF Section-4 Vol. I & Vol. II	Bill of Quantities / Pricing Document in Sealed condition in Financial package envelope as per Section 4 Vol I & II			
5		Priced BOQ in MS Excel format in a CD in sealed condition in Financial package envelope.			
6		The supporting documents/ printed literature are translated in English language and is duly certified by the authorized signatory			
7		Each page of the submittal has been numbered, signed and stamped by authorized signatory.			

Undertaking

This is to undertake that I have checked the above list with our submittal. I am also aware that if the application is not containing the above documents, our application is liable to be rejected.

Authorized Signatory

JAIPUR METRO RAIL CORPORATION LIMITED

BIDDING DOCUMENT

for

Procurement of Works

of

Supply, Installation, Testing and Commissioning of Ballastless Track of Standard Gauge from Chandpole to Badi Chaupar in Underground Sections on East–West Corridor of Jaipur Metro (Phase 1B) at Jaipur, Rajasthan, India

PART-III CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section 9 – Contract Forms (COF)

Issued on	November 2016
Invitation For	NCB No.: JP/EW/1B/JFT-1
Employer	**JAIPUR METRO RAIL CORPORATION LTD.** Khanij Bhawan, Tilak Marg, C- Scheme, Jaipur (Rajasthan) PIN-302005 Country: India

This section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

Table of Forms

Letter of Acceptance **9-2**

Contract Agreement **9-3**

Performance Security **9-5**

Advance Payment Security **9-6**

Letter of Acceptance

---- on letterhead paper of the employer ----

. . . . . date. . . . . .

To: . . . . . *name and address of the contractor* . . . . . .

Subject: . . . . . *Notification of Award Contract No.* . . . . . .

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 Bid Data Sheet* . . . . . for the Accepted Contract Amount of the equivalent of . . . . . .*amount in numbers and words and name of currency* . . . . . ., as corrected and modified in accordance with the Instructions to Bidders is hereby accepted by our Agency.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section 9 (Contract Forms) of the Bidding Document.

[Choose one of the following statements:]

We accept that _____*[insert the name of adjudicator proposed by the bidder]* be appointed as the Adjudicator.

[or]

We do not accept that _____*[insert the name of the adjudicator proposed by the bidder]* be appointed as the Adjudicator, and by sending a copy of this Letter of Acceptance to _____*[insert name of the appointing authority]*, the Appointing Authority, we are hereby requesting such Authority to appoint the Adjudicator in accordance with GCC 29.1.

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the . . . . .day of . . . . . ., ..., between . . . . . *name of the employer*. . . . . (hereinafter "the Employer"), of the one part, and . . . . . *name of the contractor*. . . . .(hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as . . . . . *name of the contract*. . . . .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,

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 Contract Agreement,

   (b) the Letter of Acceptance,

   (c) the Letters of Technical Bid and Price Bid,

   (d) the Particular Conditions of Contract,

   (e) the List of Eligible Countries that was specified in Section 5 of the bidding document,

   (f) the General Conditions of Contract,

   (g) the Specification,

   (h) the Drawings,

   (i) the Completed Activity Schedules or Bill of Quantities, and

   (j) any other documents shall be added here.[1]

3. In consideration of the payments to be made by the Employer to the Contractor as indicated 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 . . . . . *name of the borrowing country*. . . . .on the day, month and year indicated above.

[1] Tables of Adjustment Data may be added if the contract provides for price adjustment (see GCC 54.1).

Signed by .....
for and on behalf of the Employer

in the presence of:

Witness, Name, Signature, Address, Date

Signed by.....
for and on behalf the Contractor

in the presence of:

Witness, Name, Signature, Address, Date

Performance Security

Bank's name, and address of issuing branch or office[1]

Beneficiary: ..... *Name and address of employer* .....

Date: .....

Performance Guarantee No.: .....

We have been informed that . . . . . *name of the contractor. . . . .* (hereinafter called "the Contractor") has entered into Contract No. . . . . *reference number of the contract. . . . .* dated . . . . . .with you, for the execution of . . . . . *name of contract and brief description of works. . . . .* (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 Contractor, we . . . . . *name of the bank. . . . .* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *name of the currency and amount in figures* [2]*. . . . . .* (. . . . . *amount in words. . . . .*) such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation(s) under the Contract, without your 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 . . . . . , ... [3], and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458, except that subparagraph (ii) of Sub-article 20(a) is hereby excluded. [4]

. . . . . .
Seal of Bank and Signature(s)

-- Note to Bidder --

If the institution issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

1 All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

2 The guarantor shall insert an amount representing the percentage of the contract price specified in the contract and denominated either in the currency(ies) of the contract or a freely convertible currency acceptable to the employer. If the bank issuing the performance security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer.

3 Insert the date 28 days after the expected completion date. The employer should note that in the event of an extension of the time 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 [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

4 Or the same or similar to this clause specified in the Uniform Rules for Demand Guarantees, ICC Publication No. 758 where applicable.

Advance Payment Security

Bank's name, and address of issuing branch or office[1]

Beneficiary: ..... *Name and address of employer* .....
Date: .....
Advance Payment Guarantee No.: .....

We have been informed that . . . . . *name of the contractor. . . . .* (hereinafter called "the Contractor") has entered into Contract No. . . . . *reference number of the contract. . . . .* dated . . . . . .with you, for the execution of . . . . . *name of contract and brief description of works. . . . .* (hereinafter called "the Contract").

Furthermore, we understand that, according to the Conditions of the Contract, an advance payment in the sum . . . . . *name of the currency and amount in figures* [2]*. . . . . .* (. . . . . *amount in words. . . . .*) is to be made against an advance payment guarantee.

At the request of the Contractor, we . . . . . *name of the bank. . . . .* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of . . . . . *name of the currency and amount in figures*[3]*. . . . . .* (. . . . . *amount in words. . . . .*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Contractor is in breach of its obligation under the Contract because the Contractor used the advance payment for purposes other than the costs of mobilization in respect of the Works.

It is a condition for any claim and payment under this guarantee to be made that the advance payment referred to above must have been received by the Contractor on its account number . . . . . *contractor's account number. . . . .* at . . . . . *name and address of the bank. . . . .* .

The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Contractor as indicated in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that eighty percent (80%) of the Contract Price has been certified for payment, or on the . . . day of . . . . . , ... [4], whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 (*or ICC Publication No. 758 as applicable*).

. . . . . .

Seal of Bank and Signature(s)

-- Note to Bidder --

If the institution issuing the advance payment security is located outside the country of the employer, it shall have a correspondent financial institution located in the country of the employer to make it enforceable.

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1 All italicized text is for guidance on how to prepare this demand guarantee and shall be deleted from the final document.

2 The guarantor shall insert an amount representing the amount of the advance payment denominated either in the currency(ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the employer.

3 Footnote 2.

4 Insert the expected expiration date of the time for completion. The employer should note that in the event of an extension of the time 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 [6 months][1 year], in response to the Employer's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."