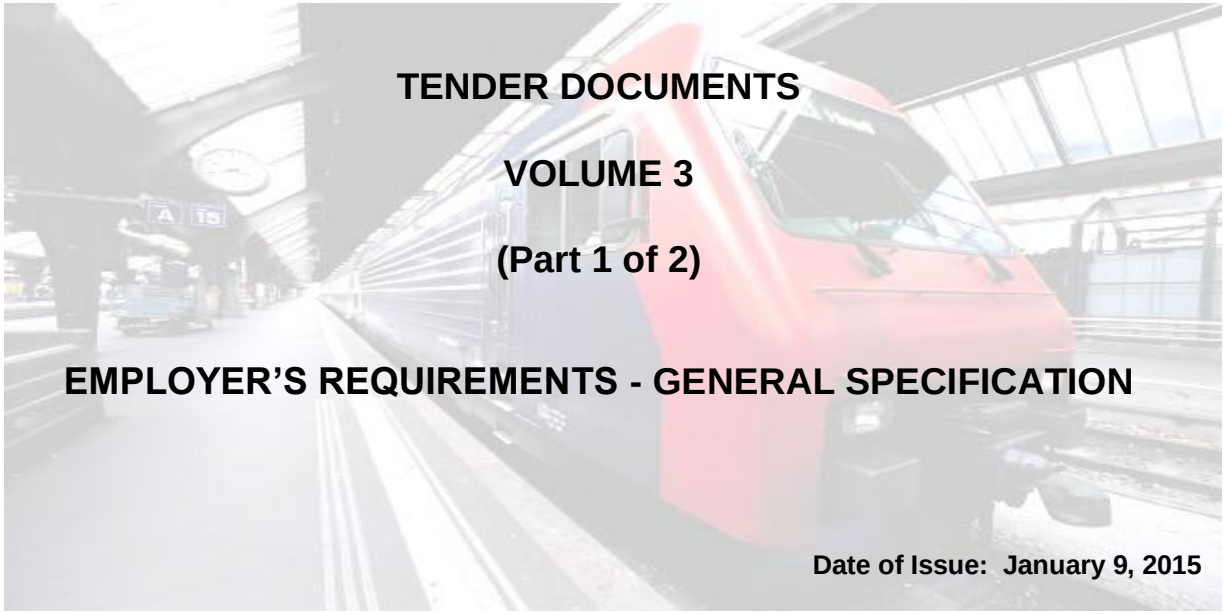
KOLKATA METRO RAIL CORPORATION LIMITED
EAST WEST METRO PROJECT

CONTRACT RS (3R)

DESIGN, MANUFACTURE, SUPPLY, TESTING, COMMISSIONING AND INTEGRATION OF PASSENGER ROLLING STOCK (ELECTRICAL MULTIPLE UNITS), AND TRAINING OF PERSONNEL



TENDER DOCUMENTS

VOLUME 3

(Part 1 of 2)

EMPLOYER'S REQUIREMENTS - GENERAL SPECIFICATION

Date of Issue: January 9, 2015

KOLKATA METRO RAIL CORPORATION LIMITED
KMRCL Bhawan (HRBC Office Complex)
Munshi Premchand Sarani,
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EAST WEST METRO PROJECT

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SUMMARY OF TENDER DOCUMENTS

Volume 1

- Notice of Invitation to Tender
- Instructions to Tenderers (including Annexures)
- Eligibility Criteria Documents
- Form of Tender (including Appendices)

Volume 2

- General Conditions of Contract
- Special Conditions of Contract (including Schedules)

Volume 3

- **Employer's Requirements – General Specification**
- Employer's Requirements – Technical Specification

Volume 4

- Schedule of Dimensions (SOD)

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- Tender Drawings

Volume 6

- Pricing Documents

Volume 7

- Safety, Health and Environment (SHE) Manual
- SHE Conditions of Contract

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CONTENTS

1. SCOPE OF THE GENERAL SPECIFICATION

1.1. General

1.1.1. This Specification covers the general aspects of the tender, description of the Works, submittal requirements of Design & Drawings, Management Plans, Project Planning and Progress Monitoring, Site Management, Drafting and CAD Standards, and Contractor's obligations for safety and health etc. This General Specification shall be read in conjunction with the General Conditions of Contract (GCC), Special Conditions of Contract (SCC), Technical Specification (TS), and Instructions to Tenderers (ITT).

2. PROJECT MANAGEMENT BY THE CONTRACTOR

2.1. Contractor's Management plans

2.1.1. In order to ensure satisfactory execution of the Contract, completion of works within specified targets, and quality in design, manufacturing and execution of work, a series of Management Plans shall be developed.

2.1.2. 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 to meet the requirements of the Employer's Requirements - Technical Specification in respect of the subjects listed.

2.1.3. The respective Plans shall be submitted for the Engineer review and approval as per the submission schedule furnished in the following table 2-A.

Table 2-A: Submission of Plans

S.N.	Plan	Milestone from LOA in Weeks
1	Project Management Plan	4
2	Interface Management Plan and detailed Interface Documents	4
3	Work Programme (Master Schedule)	4
4	Design Submission Programme	4
5	Quality Assurance Plan	8
6	System Safety Assurance Plan and Site SafetyPlan	8
7	Environmental Plan	8
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2.2. Project Management Plan

2.2.1. The Tenderer shall submit an Outline Project Management Plan as a part of the Tender, which shall provide a clear over-view of the Tenderer's organisation, the management system and methods to be used for completion of the works. The organisation resources for the design, procurement, manufacture, installation, testing, commissioning, and setting to work, shall be clearly defined.

2.2.2. The Contractor shall submit the Project Management Plan for the Engineer review as per schedule of Table 2-A. The Engineer will review the Contractor's Project Management Plan and will have the right to require the Contractor to make amendments as deemed necessary by the Engineer. The Contractor shall submit a detailed revised plan within 10 days of the review of the Engineer. It shall include:

(i) A diagram showing the organisational structure for the management of the Contract, with locations, names and position titles of staff and their line and staff relationship. The diagram shall include associate organisations and sub-contractors and show clearly the individuals and lines of responsibility linking the various groups. It shall also identify the persons designated as contacts with the Engineer.

(ii) The names, qualifications, positions and current resumes of key executive, supervisory and engineering staff to be employed full-time for the works, separately for principals and sub-contractors.

(iii) A narrative describing the sequence, nature and inter-relationship of the main Contract activities including timing for exchange of information.

(iv) The Contractor shall nominate a suitably qualified and experienced English-speaking engineer from his staff to be Project Manager. The nominee shall be subject to acceptance of the Engineer, who shall have the right to demand his replacement at any time after the work commences, should the Engineer consider this to be in the best interest of the Project.

(v) The Contractor shall also nominate a senior engineer to co-ordinate activities of the design offices and manufacturing works. The engineer shall be responsible to the Project Manager for all works executed outside India and in India for ensuring that effective co-ordination is maintained with the various manufacturing units of the Contractor, Sub-Contractors and Contractors and that contract delivery schedules are met.

(vi) The Project Manager shall be continuously on site in Kolkata and devote himself full-time to the Project, commencing not later than Thirty (30) calendar days from the date of the Commencement Date and shall continue up to the end of Defects Liability Period.

(vii) To fulfil the Contractor's obligations during the Testing, Commissioning and the Defect Liability Period, the Contractor shall nominate experienced maintenance engineers and organise deployment after obtaining the Engineer approval before undertaking testing and commissioning in depot. Separate maintenance engineer shall be positioned in the depot and they shall be supported by a dedicated team of testing / commissioning and maintenance personnel. The deployed maintenance engineer of the Contractor and supporting maintenance team in the depot shall continue up to the end of Defect Liability Period. They shall be responsible for all works arising in the supplied rolling stock based in the depot.

(viii) The work of the maintenance engineers of the depot shall be coordinated by Contractor's Chief Maintenance Engineer who shall be nominated at least 90 days before, and shall be positioned (after obtaining approval of the Engineer) at least 30 days before the start of testing and commissioning of the pilot metro train. The Chief Maintenance Engineer and maintenance engineers shall coordinate with the Engineer's nominated representative in depot and provide guidance as may be required to carry out the scheduled and un-scheduled maintenance activities from time to time. The work shall include, but not limited to, finalisation of detailed maintenance plans covering maintenance work instructions, requirements and specifications of tools, plants and test benches, test check sheets, etc.

(ix) Suitable replacement after obtaining approval of the Engineer shall be provided by the Contractor in case of absence of the Chief Maintenance Engineer and maintenance engineers from the site for a continuous period exceeding 15 calendar days, for whatever reason. In case of cumulative absence of the Chief Maintenance Engineer and / or maintenance engineers for 30 days in a calendar year, the Engineer may at his sole discretion recover a reasonable amount from the due payments to the Contractor.

(x) Timely deployment of the Chief Maintenance Engineer and maintenance engineers shall be a prerequisite for accomplishing the relevant key dates of testing and commissioning of the first train sets in the depot.

2.3. Interface Management Plan

2.3.1. Sub-systems interfaced with the vehicle are partly onboard and partly on the infrastructure. In order to ensure that these sub-systems are compatible with the vehicle design (fit in the vehicle and do not interfere with the others functionality of it), the Rolling Stock. The Contractor shall make provision for expenses in management, co-ordination, and design activities in concert with the interfaced sub-system Contractors. Description of Interfaces :

(i) Interfaces with environment:

- track layout and rolling stock dynamic gauge/swept envelope;
- track (wheel/rail interaction, lower gauge, points & turns crossing…);
- stations (platform layout, …);
- power supply (type of supply…);
- third rail (geometry,…);
- stabling (depot and on line…Depot Information System DIS);
- depot and maintenance equipment.

(ii) Interfaces with sub-systems:

- data transfer and communication protocol;
- vehicle localization;
- vehicle identification;
- vehicle maintenance assistance system;
- data transmission radio system with OCC & BCC;
- train operation system (ATO/ATP) and Automatic Train Protection (ATP);
- passengers information system (PIS);
- Passenger Screen Door (PSD)

2.3.2. The Contractor shall interface and liaise with Designated and other Contractors in accordance with the requirements of appendix D of the Engineer's Requirements - Technical Specification.

2.3.3. The Contractor shall develop and submit for the Engineer review as per schedule of table 2-A an Interface Management Plan, which is mutually acceptable to both the Contractors and the Designated Contractors. The Interface Management Plan shall include:

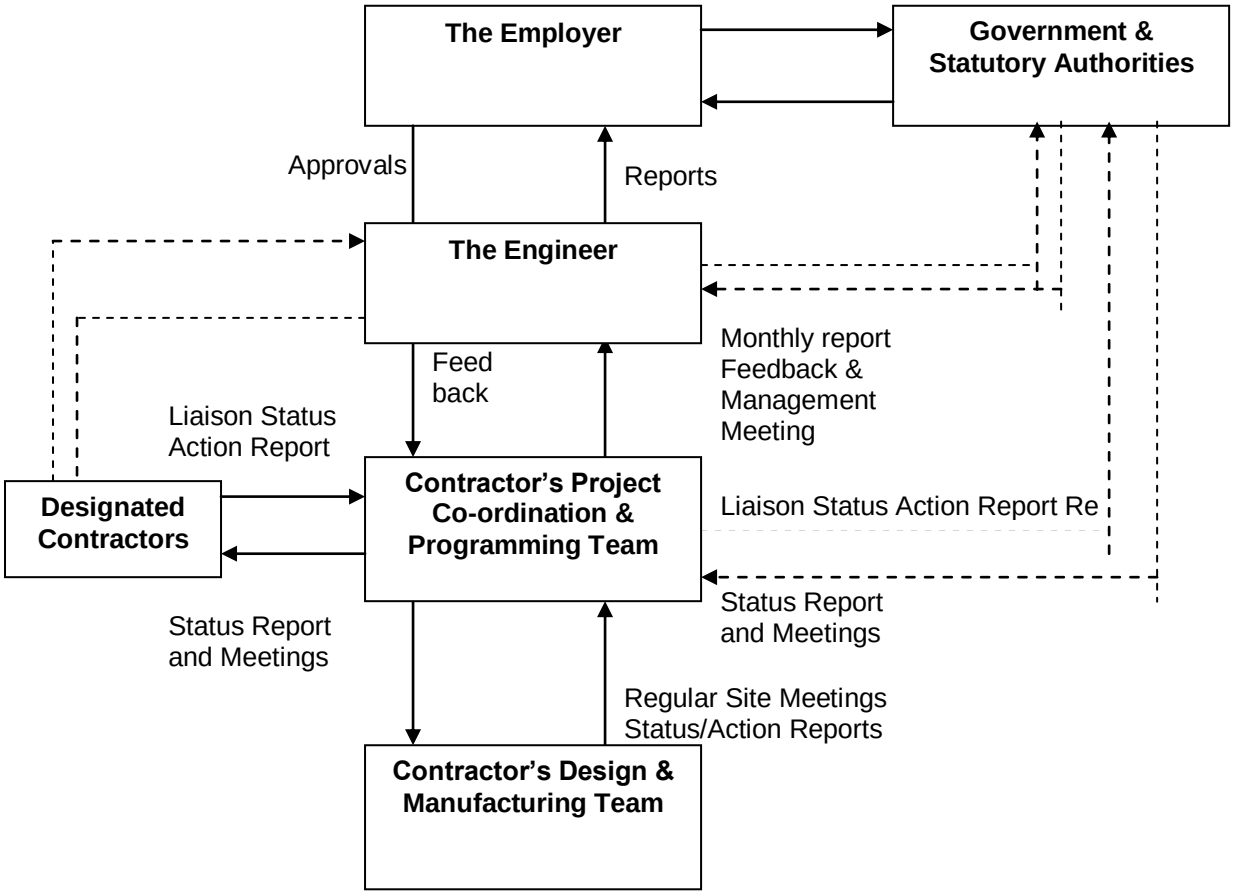
(i) Identify the sub-systems as well as the civil works and facilities with interfacing requirements;

(ii) Define the authority and responsibility of the Contractor's and Designated Contractors' (and any relevant sub-contractors') staff involved in interface management and development;

(iii) Identify the information to be exchanged, precise division of responsibility between the Contractor and Designated Contractors and integrated tests to be performed at each phase of the Contractor's and Designated Contractors' works.

(iv) Address the works program of the Contract to meet the key dates of each Contractor and highlight any program risks requiring management's attention

(v) After the review of Interface Management Plan with no objections by the Engineer, the Contractor shall execute the works in accordance with the Plan.



ORGANISATION CHART (PROPOSED INTERFACING)

2.4. Work Management Plan

(i) The Tenderer shall submit a Work Management Plan as a part of the tender which shall contain the following:

- Proposed Works Programme.
- Proposed Design Submission Programme.

(ii) The Tenderer's proposed Works Programme shall indicate how the Tenderer intends to organise and carry out the Works and achieve stages and complete the whole of the Works by the appropriate Key Dates. The Works Programme shall be prepared in terms of weeks from Notice to Proceed (NTP).

(iii) The Tenderer's Design Submission Programme shall cover the Design phase and include a schedule identifying, describing, cross-referencing and explaining the Design Packages and submissions, which he intends to submit.

(iv) The Design Submission Programme should take due account of the design co-ordination interface periods with other Designated Contractors and be consistent with the Works Programme.

2.4.1. Works Programme Submission Requirements

(i) The Works Programme submission requirements are organised into two parts:-

- Part One is a requirement for all Tenderers and shall be submitted as part of their Tender.
- Part Two describes a series of reports to be submitted by the Contractor during the execution of the Contract.

(ii) In compiling its Works Programme, and in all subsequent up-dating and reporting, the Contractor shall make provision for the time required for co-ordinating and completing the design, testing, commissioning, and integrated testing of the Works, including inter alia, design co-ordination periods, during which the Contractor shall co-ordinate its design with those of Designated Contractors, the review procedures determining and complying with the requirements of Government Departments and all others whose consent, permission, authority or licence is required prior to the execution of any work. The Works Programme shall take full account of the Design Submission Programme.

(iii) All programme submissions shall, conform to the format and level of detail specified in Appendix 1.

2.4.2. Part One-Submission By Tenderers

2.4.2.1 The Tenderer shall clearly demonstrate in his tender submission the following:

(i) The scheduling approach to the design, manufacture, testing, commissioning, integrated tests, instrumentation tests, oscillation trials and any other required tests for the pilot metro train, and service trials and their inter-relationships in the form of technically logical activity networks and also in bar chart format. These shall contain sufficient detail to assure the feasibility of the Tenderer's approach to meeting the contractual obligations. The programme shall be developed as a critical path network.

(ii) The Tenderer's capability to manage the Execution of the Works to meet the specified Key Dates. Details are given in Appendix 3.

(iii) A means to show the dates and periods relating to the Interfaces and Works of Designated Contractors. An Assumption Report accompanying the network should clearly indicate key dates, specific activities of other contracts, if any, which precede the commencement of activities, listed in the Tender Submission.

(iv) Show submission for review and review period for all major documentation required by the Contract.

(v) Clearly identify the critical path in the programme and fully described in the accompanying narrative.

The Works Programme in the Tender shall be accompanied by a narrative statement that shall describe Programme activities, assumptions and logic, and highlight the Tenderer's perception of the major constraints and critical areas of concern in the design, organisation, manufacture, supply, testing, commissioning and completion of the Works. This narrative statement shall also indicate which elements of the Works the Tenderer intends to carry out off-shore and/or in India, with details of the proposed locations of where any such work is to be carried out, the facilities available and any third party undertaking the Tenderer may have in this regard. In particular the Tenderer must state the assumptions made in respect of the interfaces with the Employer, Engineer, other contractors and third parties both in detail and time, and any requirements for information on matters, which would affect his works.

2.4.3. Part Two-Submission By Contractor

(i) Work Programme Plan

The Contractor shall prepare a plan, illustrated by sample schedules, charts, tables, etc., detailing his proposals for staff and their responsibilities to support the programming functions, for submission of works programmes for the Execution of the Works, for the design, manufacture, supply, testing and commissioning, in accordance with the key dates for co-ordinating his programmes with those of the System-wide and Civil Contractors, for measuring, monitoring and reporting progress, for revisions to the programmes to ensure completion of the Works within the specified times.

The Contractor shall submit the works programme plan as per the Employer's requirement for review of Engineer. Based on the review, the Contractor shall promptly make all amendments as required by the Engineer for his acceptance of the plan.

(ii) Preliminary Programme

The Contractor shall make a preliminary Works Programme submission in accordance with the principles set out in his accepted plan. Such submissions may make use of the tender submissions, suitably amended, to the requirements of the Engineer. The submission shall be made in accordance with the respective plans as indicated in Table 2-A.

The Contractor shall note that at the time of submission of his preliminary networks and bar charts, it may be that such Programmes have yet to be co-ordinated with the System-wide and Civil Contractors. These shall not prevent the Contractor from submission of detailed preliminary programmes using approximate dates for work of the System-wide and Civil Contractors (where such dates are not available), which has impact on the Contractor's programmes. Such programmes shall be amended subsequently to take into account the actual schedules of the System-wide and Civil Contractors. It is the Contractor's responsibility to ensure timely co-ordination with the System-wide and Civil Contractors to finalise his preliminary programmes so as not to affect the progress of the Works or those of the System-wide and Civil Contractors.

(iii) Baseline Programme

Following the Contractor's preliminary programme, submissions, no later than 90 days from the date of Notice to Proceed, the Contractor shall make re-submissions of these programmes suitably amended to take into account the programmes of the System-wide and Civil Contractors? It is the Contractor's responsibility to ensure timely co-ordination with the System-wide and Civil Contractors to review, revise and finalise his preliminary programmes so as not to affect the progress of the Works and those of the System-wide and Civil Contractors.

The resubmitted programmes when accepted by the Engineer shall form the Baseline Programme against which actual progress of the Works is measured.

As the Works progresses, it may be necessary for the Contractor to update the Baseline Programme but such updating shall only be carried out with the prior approval of the Engineer or when directed by the Employer.

(iv) Precedence Diagramming Method Logic Network

The Contractor shall submit Precedence Diagramming Method logic network when requested by the Engineer from time to time to assist him in the analysis of the Contractor's Programmes.

(v) Baseline Schedule Report

(a) The Contractor shall submit a Baseline Schedule Report in accordance with the approved format, which will quantitatively document the Baseline network and bar charts submitted. The activities in the report shall be grouped into the various phases e.g. design, manufacturing, delivery, commissioning etc.

(b) Also required with the submission of the Baseline Schedule Report is a narrative sufficient to explain the basis of the Contractor's determination of duration and to describe the Contractor's approach to meeting specified key dates. The reasons for the main logic links and outline method statements shall be provided.

(c) The Baseline Schedule Report and narrative shall be submitted together with the preliminary programme.

(d) Notwithstanding the above, the Engineer may at any time during the course of the Contract require the Contractor to reproduce the computer-generated Baseline Schedule Report to reflect actual activity dates and generate schedules based upon "what if" statements.

2.5. Quality Assurance Management Plan

2.5.1. The supplying Contract shall be executed within the framework of an efficient quality system. The international standards ISO 9001 / 2000, EN ISO 10007 are the standards of reference for the QA requirements applicable to the Contractor's (or sub-Contractor's) activities:

(i) design,

(ii) manufacturing,

(iii) on site activities.

2.5.2. The Tenderer shall submit as part of his Tender an Outline Quality Assurance Management plan, illustrating the intended means with the Employer's Requirement (Volume 3) and setting out in summary form an adequate basis for the development of the more detailed document required under specification of the Tender. The outline Quality Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the Tenderer's quality objectives with regard to the requirements of the Contract.

2.5.3. The Quality Assurance Management Plan submitted for the Engineer review as per schedule of table 2-A shall contain sufficient information to demonstrate clearly the proposed method of achieving the Quality objectives with regard to the requirements of the Contract.

2.5.4. The Quality Assurance Management Plan shall indicate the approach and structure that the detailed plan will take and shall include the following:

(i) a summary of the Project requirements including all proposed quality activities;

(ii) all quality assurance and quality control procedures proposed by the Contractor for his use in the execution of the Works;

(iii) a list of all the Codes of Practice, Standards and Specifications that the Contractor proposes to apply to his work;

(iv) the Contractor's proposals for internal and sub-contractor quality assurance audits;

(v) a statement detailing the records that the Contractor proposes to keep, the time during which they will be prepared and the subsequent period and manner in which they will be stored;

(vi) Quality Control Points and Quality Hold Points during verification, surveillance, tests, trail and commissioning activities.

(vii) procedures for maintenance of records of inspection/tests.

2.5.5. The Quality Assurance System shall be applied without prejudice to, or without in any way limiting, any Quality Assurance System that the Contractor already maintains.

2.5.6. The Contractor shall maintain the QA plan up-dated during the course of the execution of the contracts. All amendments to the original and approved QA plan shall be notified to the Engineer. The quality plan shall comprise:

(i) A Management Quality Plan for control of management related activities;

(ii) A Design Quality Plan for control of design related activities; and

(iii) A Manufacturing (including Inspection and Testing) Quality Plan for the control of related activities.

(iv) Testing and Commissioning (including Integrated Testing and Commissioning) Quality Plan.

2.5.7. The Contractor shall submit a detailed organisation chart identifying the responsibilities, authority and inter-relation of all personnel who manage, perform and verify work involving quality in respect of all Quality Plans. The organisation chart shall be specific to this Contract. The chart shall identify the Quality Management Representative who shall act as the Quality Co-ordinator for the Contractor in all dealings with the Engineer.

2.5.8. The Contractor shall audit all the activities in each Quality Plan at quarterly intervals or at other such intervals as the may require ensuring continued suitability and effectiveness of the quality management system. The Contractor shall make available upon request any document, which relates to his recent internal audits.

2.5.9. The Engineer may require compliance audits of the Contractor's quality system to be conducted. Not less than two weeks notice will be given by the Engineer. During audits, the Contractor shall provide suitably qualified staff to accompany the auditor.

2.6. System Safety Assurance Management Plan

2.6.1. The Tenderer shall submit, as part of its Tender, an Outline Safety Assurance Management Plan as prescribed in Employer's Requirement-General Specification, which shall contain sufficient information to demonstrate clearly the Tenderer's proposals for achieving effective and efficient safety procedures in the design, manufacture, testing and commissioning of the Rolling Stock on the section. The Outline Safety Plan should include an outline of the safety procedures and regulations to be developed and the mechanisms by which they will be implemented for ensuring safety including Hazard Analysis, Fire control, EMC/EMI control, RAM (Reliability, Availability and Maintainability) requirements as given in Employer's Requirements-(Volume 3), site safety, transportation of rolling stock etc.

2.6.2. The Outline Safety Assurance Management Plan shall be headed with a formal statement of policy in relation to safety and shall be sufficiently informative to define the Tenderer's Safety Plan and set out in summary an adequate basis for the development of the site safety and safety in transport. The Tenderer may be requested to amplify, explain or develop the Outline Safety Plan prior to the date of acceptance of the tender and to provide more detail with a view to reaching provisional acceptance of such a plan.

2.6.3. The Contractor shall submit for review by the Engineer, a System Safety Assurance Management Plan for the Engineer review as per schedule of table 2-A. The Safety Assurance Management Plan shall contain sufficient information to demonstrate clearly the Contractor proposals for achieving effective and efficient safety procedures and solutions in the design, manufacture, testing and commissioning of the Rolling Stock. It shall include but not limited to:

(i) The Hazard Analysis report in accordance with the requirements of Chapter 19 of the Employer's Requirements - Technical Specification shall evaluate and ensure that all the hazards are identified and satisfactorily resolved.

(ii) The Fire Safety analysis report in accordance with the requirements of Chapter 19 of the Employer's Requirements - Technical Specification shall evaluate and ensure inter alia that the fire loadings of material proposed to be used, and the fire withstand ratings etc are as per the requirements specified in the Engineer's Requirements -

Technical Specification and also are compatible with currently accepted international practices.

(iii) The EMC/EMI Control Plan shall evaluate and ensure that the requirements for electromagnetic compatibility and interference as specified in the Employer's Requirements - Technical Specification for all elements of the system are met.

2.7. Reliability, Availability and Maintainability Assurance Management Plan

2.7.1. The Contractor shall submit for review by the Engineer, a Reliability, Availability and Maintainability Assurance Management Plan and maintenance programs (inspections service checks and maintenance activities) for the Engineer review as per schedule of table 2-A in accordance with the requirements of Chapter 19 of the Employer's Requirements - Technical Specification.

2.7.2. The Contractor shall describe procedures required to perform the specific tasks necessary to achieve RAM requirements in the Reliability, Availability and Maintainability Plan.

2.8. Site Safety Management Plan

2.8.1. The Contractor shall also submit Site Safety Plan for the Engineer review as per schedule of table 2-A and also a plan for safe transport of rolling stock to the depot as per requirements of Chapters 11 of this Engineers Requirement, General Specification.

2.9. Software Quality Assurance Management Plan

2.9.1. The Contractor shall submit a Software Quality Assurance Plan for the Engineer review as per schedule of table 2-A in accordance with the requirements of Chapter 7 of this Employer's Requirements - General Specification,.

2.10. Environmental Management Plan

2.10.1. The Tenderer shall submit as part of this Tender an Outline Environmental Management Plan, as prescribed in Employer's Requirement-General Specification illustrating the intended means of compliance with the Employer's Safety, health and Environmental(SHE) Manual. Outline Environmental Management Plan shall also contain sufficient information to demonstrate clearly the proposed method of achieving the Environmental objective with particular reference of Noise, Vibration, EMC/EMI etc. to meet the stipulation of chapter 3 of Employer's Requirements-Technical Specification.

2.10.2. The Contractor shall submit as part of this Tender an Outline Environmental Plan for the Engineer review as per schedule of Table 2-A illustrating the intended means of compliance with the Engineer's Environmental Quality Management requirements. The Environmental Management Plan shall contain sufficient information to demonstrate clearly the proposed method of achieving the Environmental objectives with particular reference to Noise, Vibration (Noise and vibration analysis report), EMC/EMI (EMC/EMI analysis report) etc. to meet the requirements of Chapter 3 of Employer's Requirements -Technical Specification.

2.10.3. The Tenderer may be requested to amplify, explain or develop his Outline Environmental Plan prior to the date of acceptance of the tender and to provide more detail with a view to reaching provisional acceptance of such a plan

2.11. Inspection, Testing and Commissioning Management Plan

2.11.1. The Tenderer shall submit as part of this Outline Inspection, Testing and Commissioning Management Plan as prescribed in Employer's Requirements – General Specification.

2.11.2. The Contractor shall submit an Inspection, Testing and Commissioning Management Plan as per schedule of Table 2-A for the Engineer review as required in chapter 20 of the Employer's Requirements – Technical Specification.

2.12. Review Periods for Contractor's Submissions

2.12.1. The Engineer shall review those Contractor's plan and programme submissions which require his acceptance and shall signify his acceptance or otherwise within 30 days. The Contractor shall, when required by the Engineer, re-submit his programmes within 14 days of receipt of the Engineer's comments.

The Engineer will endeavour to review and respond to the Contractor on the adequacy and acceptability of the Contractor's submissions and re-submissions as soon as reasonably possible but the Contractor should always allow for a 30 day review period.

The Contractor shall allow in his programme a 30-day review period for all submissions to the Engineer.

2.13. Failure to Make Submissions

2.13.1. Failure of the Tenderer to submit any plan and programme with the tender as required within the employer's requirements-General Specification: Appendix 9-Tender Submittals, will deem the Tender submission as non-responsive and tender may be rejected.

2.13.2. Failure of the Contractor to submit any plan and programme, or any required revisions within the time limits stated shall be sufficient reason for certification that the Contractor is not performing the work required in a timely manner. The Engineer may certify retention of payment under the Milestone-related Schedule of Payments proposed for the Contractor, until his plans and programmes are accepted by the Engineer, and may also cause imposition of Liquidated Damages.

2.14. Plans and Programme Revision

2.14.1. The Contractor shall revise his plans and programmes whenever necessary, with the consent of, or as required by the Engineer to ensure completion of the Works within the times for completion prescribed in the Contract

2.15. Planning and Programming Staff

2.15.1. The Contractor shall employ sufficient number of planning and programming staff competent in the use of the programming software and with a good knowledge of the type of work required to be performed by the Contractor under the Contract.

The Engineer shall have the discretion to require the Contractor to replace his planning and programming staff if the Engineer considers that they do not have the training or skill required for this much specialised nature of work.

2.16. Project Calendar

2.16.1. Project Weeks shall commence on a Monday. A day shall be deemed to commence at 00:01 hours on the morning of the day in question. Where reference is made to the completion of an activity or Milestone by a particular week, this shall mean by midnight on the Sunday of that week.

2.17. Progress Reports

2.17.1. Progress reports, as detailed in Appendix 2, shall be regularly submitted by the Contractor, on a monthly basis.

2.18. Co-ordination and interface with Designated and other Contractors

2.18.1. The Contractor is responsible for detailed co-ordination of his design and manufacturing activities with those of the System-wide Contractors, Civil Contractors, Consultants and other Contractors whether or not specifically mentioned in the contract, who may be working on or adjacent to the site for the purpose of the Project.

2.18.2. All of the above parties are referred to as Designated Contractors. A list of some of the main Designated Contractors and some of the identified major interfaces are given in **Chapter 24** of the Engineer's Requirements – Technical Specification. The Contractor shall note that there are other contractors, consultants, agencies etc, which the Engineer may engage from time to time, and with whom the Contractor shall have to similarly co-ordinate. Such co-ordination responsibilities of the Contractor shall include the following, but need not be limited to:

(i) To provide all information reasonably required by the Designated Contractors in a timely and professional manner to allow them to proceed with their Design, Manufacturing, Construction activities, and to meet their milestones and key dates.

(ii) To ensure that the Contractor's requirements are provided to all other Designated Contractors, in a timely and reasonable manner.

(iii) To obtain from the Designated Contractors information reasonably required, to enable the Contractor to meet his own design submission dates.

(iv) To ensure very close co-ordination with Signalling & Communication Contractor, in respect of provision of Signal and Communication equipment in the cars, and finalising the interface between the Rolling Stock and Signalling & Communication equipment.

(v) Where the execution of the work of the Designated Contractors depends upon the site management or information to be given by the Contractor, the Contractor shall provide to such Designated Contractors the services, or the correct and accurate information required, enabling them to meet their own program or construct their own works.

(vi) To ensure that there is no interference with the works of Designated Contractors.

(vii) To attend regular co-ordination meetings convened by the Designated Contractors and the Engineer. The Contractor shall conduct separate meetings with the Designated Contractors as necessary to clarify particular aspects of the designated requirements of the Works. A record of the decisions taken in each such meeting shall be furnished to the Engineer. The party who convenes the meeting shall prepare minutes recording all matters discussed and agreed at the meeting.

(viii) To ensure that all correspondence, drawings, meeting minutes, programs, etc. relating to the Contractor's co-ordination with the Designated Contractors are issued to all concerned parties and four copies issued to the Engineer no later than seven calendar days from the date of such correspondence and meetings.

2.18.3. The Contractor shall in carrying out his co-ordination responsibilities raise in good time and provide sufficient information for the Engineer to decide on any disagreement between the Contractor and the Designated Contractors as to the extent of services or information required to pass between them.

2.18.4. If such disagreement cannot be resolved by the Contractor despite having made all reasonable efforts, then the decision of the Engineer shall be final and binding on the Contractor.

2.18.5. Where a Designated Contract is yet to be awarded, the Contractor shall proceed with the co-ordination activities with the Engineer until such time as the Designated Contractor is available. The Contractor shall provide the Designated Contractor with all information necessary to enable the Designated Contractor to follow-on and proceed with their co-ordination.

2.18.6. Any claim of additional costs by the Designated Contractors as a result of the Contractor's failure to keep to specified dates shall be borne by the Contractor. The Contractor shall note that the information exchange is an iterative process requiring the exchange and up dating of information at the earliest opportunity and shall be carried out on a regular and progressive basis in order for the process to be completed for each design stage by the specified dates. Engineer shall have full right to impose liquidity damages on the contractor should there be an impact of these delays in achieving the key dates. Decision of Engineer shall be final and binding.

2.18.7. The Contractor shall establish a dedicated co-ordination team, led by a Co-ordinator reporting to the Contractor's Project Manager. The primary function of the team is to provide a vital link between the Contractor's design and manufacturing teams and the Designated Contractors. The Engineer shall have the right to require the replacement of the Co-ordinator if in his opinion the Co-ordinator is unable to meet the co-ordination requirements of the Contract. The Contractor's attention is drawn to the need for the Co-ordinator to establish effective dialogues and communication links with the Designated Contractors. The Contractor's co-ordination team shall comprise a mix of personnel with experience in both design and manufacture of rolling stock necessary for effective co-ordination.

2.18.8. The Coordinator shall assess the progress of co-ordination with Designated Contractors by establishing lines of communications and promoting regular exchange and updating of information so as to maintain the Contractor's program.

2.18.9. The complexity of the project and the importance of ensuring that work is executed within time limitations require detailed programming and monitoring of progress so that early program adjustments can be made in order to minimise the effects of potential delays.

2.18.10. The Coordinator in conjunction with the Designated Contractors shall identify necessary provisions in the Works for plant, equipment and facilities of the Designated Contractors. These provisions shall be allowed by the Contractor in his design of the Works.

2.18.11. During the course of the contract, information will be obtained in a number of ways, including direct inspection, regular site meetings, the obtaining of progress reports and the use of turn round documents to obtain design and program data. Turn round documents shall be issued to the Designated Contractors to be returned giving the current positions on their program.

2.18.12. They must open an office in Kolkata at their own cost.

3. DESIGN SUBMISSION REQUIREMENT

3.1. General

3.1.1. The objective of the design submission process is to ensure that the proposed resulting works comply with the specifications, are capable of being produced consistently to exacting quality standards, achieve low life cycle costs and can be operated safely to the satisfaction of the Engineer.

3.1.2. The design submissions include Design Calculations, Design Reports and Design Drawings.

3.1.3. In the event that a statutory body (e.g. Government of India - Ministry of Railways or Ministry of Urban Development, RDSO, Commissioner of Metro Railway Safety etc.) requires design information in a particular format, it shall be incumbent upon the Contractor to provide the same, as directed by the Engineer.

3.2. Review of Data

3.2.1. As soon as practicable after Contract Award, the Contractor shall review all applicable data, criteria, standards, directives and information provided to him as the basis for design. Any apparent inconsistencies or erroneous information shall be brought to the attention of the Engineer. Such information shall not alleviate the Contractor from his responsibilities under the Contract.

3.3. Format of Deliverables

3.3.1. Drawings and CAD data shall comply with the requirements of Appendix 4 of this General Specification: Drawing and CAD Standards. Reports, calculations, specifications, technical data and similar documents shall be provided in A4 format, and one of the copies shall be ring bound to facilitate photocopying. A3 size drawings included in documents shall be folded to A4 size.

3.3.2. Drawing and CAD Data Format :

Within 30 days of Notice to Proceed, the Contractor shall have prepared and submitted the drawing and CAD procedures together with sample drawings and corresponding CAD data to demonstrate his understanding and compliance with Appendix 4 of this General Specification: Drawing and CAD Standards.

3.4. Number of Copies

3.4.1. The following quantities of drawings and other documents shall be submitted to the Engineer, including preliminary, pre-final, and final design submissions, the final contract document, and all other submissions. These drawings and documents are in addition to those required for the exchange of information between Designated Contractors and other submissions to statutory, governmental and local authorities.

(i) 7 full-size sets of paper drawings (folded and collated)

(ii) 7 sets of design documents and calculations.

(iii) 5 copies of Design Status Report and Design Statement.

(iv) 5 sets of all other submissions.

(v) 2 sets of each of the above in electronic format

3.5. Design Submission Programme

3.5.1. The Contractor shall prepare the Design Submission Programme, which is to set out fully the Contractor's anticipated programme for the preparation, submission and review of the Design Packages, the Final Design Submission and the Installation and Manufacturing Drawing Submissions and for the Issue of Notices in relation thereto.

3.5.2. The Design Submission Programme shall:

(i) be consistent with and its principal features integrated into the Works Programme, and show all relevant Milestones and Key Dates;

(ii) identify dates and subjects by which the Engineer's decisions should be made;

(iii) Some milestone activity data are flexible, the contractor may propose data matching with key dates.

(iv) make adequate allowance for periods of time for review by the Engineer and other review bodies;

(v) indicate the Design Interface and Co-ordination periods for each Designated Contractor.

(vi) include list of requisite design details for each and every component or equipment of all sub-systems and systems.

The Contractor shall update the Design Submission Programme suitably if Engineer observes any deviation.

3.5.3. For System, sub-system and components the Contractor shall submit documents and drawings describing function description, product description, interface requirement description, RAM requirement description, Life cycle calculations, Type & routine test specifications, list and details of spares, related calculations etc. The Design Submission Programme shall also include listing of various Plans, processes and other submissions.

3.6. Design Process

3.6.1. The Contractor shall deploy Design staff having sufficient experience in Kolkata at all times to maintain liaison with the Engineer. The principal requirement of the Design Phase is to undertake the design during this phase in three stages :

(i) the preparation of the Preliminary Design;

(ii) the preparation of the Pre-final Design; and

(iii) the preparation of the Final Design.

3.7. Preliminary Design

3.7.1. The purposes of the Preliminary Design submission are as follows:

(i) State the design criteria;

(ii) Design the overall system, and propose the system configuration;

(iii) Identify the functions of each system, sub-system, equipment or other element within the overall design, and specify the relationships and interfaces between elements of the system;

(iv) Identify the functions of each system, sub-system, equipment or other element within the overall design, and identify the relationships and interfaces between elements of the Contractor's system and those of other Designated Contractors; and

(v) Verify the tender designs and calculations.

3.8. Pre-Final Design

3.8.1. In the Pre-final Design stage the conceptual designs (including interfaces with those of Designated Contractors of the Employer, and of the Contractor's vendors) are required to be fully developed. In this stage, each element of the system will be considered and preliminary specifications with supporting calculations developed. Preliminary electrical and control schematics shall be developed to illustrate how various operational and functional requirements are achieved. Software design and development shall also be carried out at this stage.

3.8.2. Manufacturing units will be allowed to commence production only after receiving 'no objection' advice from the Engineer. This submission shall include sufficient detail from prospective suppliers to demonstrate that they have adequate understanding of the requirements. It will include either evidence of or proposals for design verification. Interfaces with other Designated Contractors shall be finalised by this stage.

3.9. Final Design

3.9.1. The purpose of the Final Design submission is to agree with the Engineer that the equipment is satisfactory, compliant with the specification, fit for purpose and safe. The Final Design shall be the level of design developed to the stage where all manufacturing drawings (including those received from Designated Contractors of the Employer, and vendors of the Contractor) are fully defined and specified and in particular:

(i) calculations and analyses are complete;

(ii) all main and other significant elements are delineated;

(iii) all other work, including studies, investigations and reports are complete

(iv) All remarks/observations made in Mock up are complied.

3.10. Design Submission and Review Procedure

3.10.1. All design submissions from the Contractor shall be made under a Design Review Certificate Application (DRCA) notice. The following DRCA numbering system as instructed by the engineer shall be used to identify all submissions:

<Contract No.>/<Subject Code>/<Stage Code>/<Sequence No.>/<Revision No.>

3.10.2. The contract number shall be limited to not more than four digits and reflect the contract number only.

3.10.3. The stage code and subject codes should be developed in conjunction with the Engineer to help identify particular types of submissions, e.g., type of service or equipment. A schedule of subject codes for each contract should be submitted to the Engineer for acceptance.

3.10.4. The contractor shall ensure that all submissions are correctly numbered in accordance with the schedule. The sequence code shall be a unique sequential number for each submission for each particular subject. Revision numbers shall be used when a re-submission is required, i.e. a DRCA was awarded "Not Accepted". For the initial submission the revision code of DRCA number shall be left blank.

3.10.5. Upon receipt of design submissions from the Contractor, a copy of the DRCA will be signed, dated and returned by the Engineer.

3.10.6. The Engineer shall issue Design Certificate Consent (DCC) Sheet properly dated and numbered to Contractor for each of the DRCA. The DCC will carry status as Notices of "No Objection", "Notices of No Objection, subject to…." and decisions made by the Engineer in response to a Design Review Certificate Application made by the Contractor. The Design

Certificate Consent (DCC) Sheet properly dated and numbered shall be sent to the Contractor. The consent sheet number shall be the same as the Design Review Certificate Application number except that the letters "DRCA" are replaced by "DCC".

3.10.7. When significant comments are noted by the Engineer on the design submission, the "DRCA" shall be returned "Not Accepted", and signed by the Engineer. One copy of the "DRCA" shall be returned to the Contractor together with the comments on why the submission was rejected.

3.10.8. When minor comments are noted by the Engineer on the design submission and it is "No Objection, but Subject to Comments" the "DRCA" will have the appropriate decision indicated upon it and be signed by the Engineer. One copy of the DCC, together with comments, will be returned to the Contractor.

3.10.9. A submission will be rejected automatically if not signed by the Contractor's Authorised Design Representative.

3.10.10. Upon receipt of a decision sheet from the Engineer, the "DCC" will be signed, dated by the Contractor, and returned to the Engineer.

3.11. Engineer's Review

3.11.1. The Engineer will complete his review of the submission within 30 calendar days), after which the review comments in writing or on marked up drawings and specifications will be furnished to the Contractor. The Contractor shall then meet with the Engineer to discuss the review comments. Within two weeks of the receipt of the Engineer's comments the Contractor shall submit his proposals for implementation in the next submission. Where the comments are minor, such proposals may be clarified by calculations, part prints, etc. acceptable to the Engineer and included in the Contractor's next submission. Should the Engineer deem the submission to be unacceptable, the Contractor shall revise and re-submit the entire submission within two weeks, unless otherwise agreed with the Engineer.

3.11.2. After Engineer's review of the design submissions, the Contractor shall update the documentation incorporating Engineer's observations and also other design requirements. For all subsequent submissions, the Contractor shall demonstrate that all the previous comments by Engineer have been incorporated. The Comments previously issued by Engineer shall also become part of the submission.

3.11.3. The Employer is of the understanding that the Contractor will need to depute a team of its design engineers for interaction with Employer's experts at Kolkata. Employer at his discretion may also consider deputing a team of engineers (around six) to Contractors design office or at Sub vendor's office for requisite duration with a view to expedite finalization of designs. In such case, Contractor shall provide office facilities and bear full expenditure towards out of pocket allowance, travel expense (as per entitlement), boarding, lodging etc. Such visit(s) as described above shall not be considered as part of inspection activity.

3.11.4. The Engineer will decide whether the submissions belong to his Information or Review and accordingly mark comments for further discussions / alterations. The contractor shall be responsible for the proposed designs for its safety and performance as per Employers' requirements.

3.12. Final Design Document Delivery

3.12.1. To achieve agreement with the Engineer on the completion of the design and to allow the formal submission of the Final Design, the Contractor shall submit a list of all accepted Design Submissions to the Engineer for review along with self-adhesive stickers signed by the Contractor's Representative (CR). If there is no objection by the Engineer, he shall then sign and return the self-adhesive stickers to the Contractor for affixing to the amended Final Design Drawings (original) prior to their submission under the Final Design Document Delivery.

3.12.2. Based on the Engineer's review of the Final Design Submission, the Contractor shall then re-submit the entire Final Design Submission together with the following documents :

(i) joint statements of completed design interface with the Designated Contractors of the Employer;

(ii) a signed statement confirming that he has incorporated all comments of the Engineer.

(iii) a Design Certificate duly endorsed, as shown in Appendix 5.

This above jointly will be known as "Final Design Document Delivery"

3.13. As-Built Drawings and Documents

3.13.1. As-built drawings are intended to show the works exactly as constructed. These are prepared by amending the manufacturing drawings to take into account changes necessitated by manufacturing methodology. These drawings shall be completed on a regular basis as the works progress, and not left until the completion of the Defect Liability Period.

3.13.2. At least 3 months but not more than 6 months prior to the anticipated date of delivery of the pilot metro train, the Contractor shall compile and submit to the Engineer for recording purposes all those documents and drawings which in the opinion of the Contractor, constitute the complete record of the design and manufacture of the Works.

3.13.3. The updated compilation of the complete record of the design and manufacture of the Works shall be submitted at the end of the Defect Liability Period.

3.14. Post Acceptance Changes

3.14.1. Changes to accepted drawings, whether they are initiated by the Contractor or the Engineer, shall be submitted through the DRCA system. The same process of submission, review and acceptance as described above shall be adopted. Upon acceptance of the post acceptance change, the Engineer shall issue a DCC to this effect. Submission as a result of a post acceptance change shall use a new DRCA number, i.e. not a previously used one.

3.14.2. The Contractor may propose a alternative procedure for implementing post acceptance changes (hardware and software) for review of the Engineer.

3.14.3. For requesting any change to the accepted design the Contractor shall submit the relevant design details for review of Engineer. The Contractor shall not implement any change without receiving 'No objection' from the Engineer.

4. INSPECTION, TESTING AND COMMISSIONING

4.1. General

4.1.1. The Contractor shall submit Inspection, Testing and Commissioning Management Plan for Engineer's review as per schedule furnished in table 2-A. The purpose of the inspection, testing and commissioning Management Plan is:

(i) To provide evidence as to how the Contractor will plan and program his tests and inspection and test activities.

(ii) To allow the Contractor to indicate his "Witness and Quality hold points" for selected operations.

4.1.2. The Inspection, Testing and Commissioning Management Plan shall be prepared in accordance with the requirements of Chapter 20 of the Employer's Requirements – Technical Specification. This plan shall also include Integrated Testing and Commissioning of Trains in the Section and Service Trials before introduction in Revenue Service. The Plan shall contain, but not limited to, the following topics:

(i) the Contractor's methodology for inspection, testing and commissioning;

(ii) all Inspections and Quality Hold Points;

(iii) Inspection, testing and acceptance operations performed on the parts during and after fabrication,

(iv) Inspection, testing and acceptance operations performed on subassemblies composed of these parts, if any,

(v) Inspection or test operations performed during on site activities.

(vi) Tests, Inspections and examinations performed on systems assembled in shop and site.

(vii) the interdependency and inter-relationship with Designated Contractors and their commissioning programme;

(viii) the objectives of each test and criteria for successful tests;

(ix) organisation chart and CV of key personnel in the Testing and Commissioning team;

(x) documentation for conducting tests and submission of Testing and Commissioning procedures.

4.1.3. Inspection Hold Points

(i) The Contractor shall, propose a set of inspection hold points in the Inspection, Testing and Commissioning Plan. The hold points shall be structured so that a formal hold point is allowed for each significant element of the car's manufacturing process. At each hold point the Inspecting Officer appointed by the employer shall hold a formal inspection, or advice that the inspection has been waived.

(ii) The manufacturer of each car or part thereof shall not proceed until the inspection by the Inspecting Officer has been completed or waived.

(iii) The Employer and the Engineer shall be afforded the opportunity of inspecting all cars, trains and mock–up to be delivered under the Contract before they leave the Contractor's premises. No car shall be considered ready for delivery without Engineer's endorsement in writing.

(iv) The Contractor shall advise the Engineer no fewer than 30 days in advance of a car or train being available for inspection, and shall notify him of the tests proposed to be carried out. In case, inspection is not carried out at the time agreed upon as a result of the Engineer not being available, the Contractor shall notify the Engineer immediately and he will deploy an Inspecting Officer within one week. In case the Inspecting Officer fails to turn up within this period, the Contractor may proceed with

the work and the Inspection Certificate issued by the Manufacturer will be expected by the Engineer.

(v) Once the Inspection and any required remedial actions are completed to the satisfaction of the Engineer, he shall give consent for the cars' or trains' shipment and/or dispatch.

4.1.4. Basically, the contractor or his Sub Contractor is responsible for the execution and recording of all inspections and tests which are to be found on the test and commissioning plan. All the technical conditions of the material manufacturing and testing have to be included in the material and part acceptance certificates.

4.1.5. For manufacturing and on site activity surveillance, the Contractor will develop and implement a test and commissioning plan, which includes acceptance tests. EN 50215 can be used as a guideline for test after completion and before entry in the service.

4.1.6. The Engineer will then check the plans to see whether, it meets the requirements. The Engineer shall inform the Contractor in writing within a reasonable period after receipt of the above information;

(i) that the Contractor's proposed methods of inspection, testing and commissioning (including Integrated Testing and Commissioning) have the consent of the Engineer; or

(ii) in what respects, in the opinion of the Engineer the Contractor's proposed methods etc

(iii) fail to comply with the Employer's Requirements and/or the Final Design Document;

(iv) would be detrimental to the Works and/or to the other works comprising the Project;

(v) do not comply with the other requirements of the Contract; or

(vi) as to the further documents or information which are required to enable the Engineer to properly assess the proposed methods of inspections, etc.

4.1.7. In the event that the Engineer does not give his consent, the Contractor shall take such steps or make such changes in the said methods or supply such further documents or information as may be necessary to meet the Engineer's requirements and to obtain his consent. The Contractor shall not change the methods of inspection, testing and commissioning (including Integrated Testing and Commissioning) which have received the Engineer's consent without further review and consent in writing of the Engineer.

4.1.8. Notwithstanding the foregoing provisions of this Chapter, or that certain of the Contractor's proposed methods of inspection etc. may be the subject of the consent of the Engineer, the Contractor shall not be relieved of any liability or obligation under the Contract.

4.1.9. The Engineer shall have the facility to monitor all tests and have access to all test records. Ample time shall be allowed within the testing programme for necessary alterations to equipment, systems and designs to be undertaken, together with re-testing prior to final commissioning.

4.1.10. Unless agreed in writing by the Engineer, personnel engaged on testing shall be independent of those directly engaged in the design or installation of that equipment.

4.1.11. All test equipment shall carry an appropriate and valid calibration label and / or certificate.

4.1.12. For each of the identified tests, the contractor shall produce a test report, in three copies, and in an approved format, within an agreed period following the test, for acceptance by the Engineer. The Contractor shall sign all reports of Tests. The Engineer reserves the right to reasonably call for additional tests if considered necessary.

4.2. Non Conformity and deviation disposition

4.2.1. The Non Conformity and Deviation detected/observed during manufacturing, testing and Commissioning shall be grouped into essentially three types and shall be dealt as under:

(i) Type 1: Non-Conformity not in violation with the Contractual Technical Specifications or design documents originated by the contract and approved by the Engineer..

(ii) Type 2: Non conformity with the Contractual Technical Specification or Design Technical Specifications or Documents issued by the Contractor and approved by the Engineer but which can be reconciled with the applicable Specification.

(iii) Type 3: Nonconformity with the Contractual Technical Specification or Design Technical Specifications or Documents issued by Sub-Contractors and approved by the Engineer which cannot be reconciled with the applicable Specification. Some examples of this group of non-conformity but not limited to are:

- equipments, component or system unable to meet functional on performance requirements;
- critical dimensions (involved in the stress analysis report of interface dimensions) out of tolerance;
- inspection or control not carded out and being impossible to be repeated;
- component without appropriate identification to ensure its recording.

4.2.2. These types of non-conformity shall be recorded in a Non Conformity Report (NCR) and reported by the Contractor to the Engineer for processing and disposition. The Contractor shall propose the final solution and submit to the Engineer for approval during a meeting before implementation.

4.3. Engineer's Stop Work Order (SWO)

4.3.1. The Engineer or his representative will have the general responsibility to verify that the manufacturing and its associated control or test operations are performed in accordance with the contractual documents and technical specification.

4.3.2. A stop work order is issued when significant situations adverse to quality are noted and immediate action is required.

4.3.3. The stop work order shall be issued under the following conditions:

(i) equipment procured by the Contractor is not able to meet the specified quality level,

(ii) Use of non-approved drawings or documents during the manufacturing of items or equipment by the Contractor (or his Sub-Contractor),

(iii) repetitive non-conformity without appropriate corrective action by the Contractor (or his Sub-Contractor),

(iv) Contractor (or his Sub-Contractor) frequently ignores the Engineer's observations regarding inspections,

(v) or when a significant non compliance of the QA Plan is detected,

4.4. Engineer's Corrective Action Requests (CAR)

4.4.1. During the course of performing audit or inspection, the Engineer may identify situations which are contrary to product quality or may lead to products of indeterminate quality and in such situation the Engineer shall issue a CAR (Corrective Action Request).

4.4.2. On receipt of CAR, the Contractor shall take Corrective Action at no extra cost and shall return the CAR to the Engineer. In this regard, the Engineer's decision shall be final.

4.5. Test Groups

4.5.1. The tests are organised into two broad groups:

(i) Design qualification testing or type test which includes verification of the design to the performance specification and demonstration testing on single articles of equipment.

(ii) Acceptance testing or routine tests which verifies that the equipment is conforming to, selected specification requirements at various stages of production and commissioning.

4.5.2. The tests also can be detail grouped as follows:

(i) Routine and type tests of components, equipments and sub-systems in accordance with relevant standards and specifications in Contractor/Sub-contractor's factories.

(ii) Factory acceptance Tests as a type test for the first train (pilot) at location of car body assembly (function test of vehicle) in accordance with IEC 61133.

(iii) Type test of the first metro train (pilot) at test centre if any (traction and braking performance, door system).

(iv) Type test of the first metro (pilot) train in Kolkata including instrumentation and oscillation trials in accordance with IEC 61133.

(v) Factory acceptance Tests as routine test of all the metro trains at location of car body assembly (function test of the vehicle) in accordance with IEC 61133.

(vi) Acceptance / Integration Tests for all the metro trains in Kolkata in conjunction with works of all designated Contractors in accordance with IEC 61133.

(vii) Service Trials.

5. WARRANTY (DEFECT LIABILITY PERIOD)

5.1. General Warranty conditions

5.1.1. The warranty period for metro trains no.1 to 5 starts with the temporary Acceptance (Taking Over Certificate signed) of the metro train no 5 when a sufficient fleet to start the revenue service will be delivered and commissioned into commercial service after integrated test and trials on this section. For each following metro train delivered, the general warranty starts after temporary Acceptance of each metro train for commercial service after completion of integrated tests and trials.

5.1.2. The individual warranty period for each metro train shall be Twenty four (24) months after completion of integrated tests and trials and the temporary acceptance, as defined in chapter 4 of the Engineer's Requirements – General Specification related to the vehicle acceptance.

5.1.3. The Contractor shall be responsible for any defect or failure attributable to defective design, material or workmanship during the Warranty period. The Contractor will not be liable for damages caused because the Engineer or any other third parties did not follow the written operation and maintenance instructions or did not use the Metro trains in accordance with the Technical Documents.

5.1.4. The final acceptance will not cancel the particular conditions specified in the contract, such as hidden defects, reliability requirements, life span, etc.

5.2. After sale services

5.2.1. During this period, the Contractor will undertake the necessary repair works due to failure at his own risk and expense including spare parts and labour.

5.2.2. All the equipment and material necessary for testing, defects and repair in connection with warranty obligations will be provided by the Contractor bearing all the connected expenses.

5.2.3. Spare parts for faulty components replaced shall be provided by the Contractor and are not included in the stock of spare parts that will be provided for the regular maintenance purpose. In the other case a specific agreement between the Engineer and the Contractor shall be set up.

5.2.4. "After sale" service organisation set up by the Contractor during all the warranty period including any extension shall be described in term of permanent resident staff, with requisite qualification and experience. During the warranty period, the Contractor shall be responsible free of charge for the detection and repair of defects and components replacements where the metro train does not conform to the Functional specification and performance requirements. Normal wears and tears are excluded from these defects.

5.2.5. The repair and or replacement of failed components and equipment and installation of repaired/replaced components/equipment shall be undertaken by the Contractor free of charge at Site. The Contractor shall bear custom duty, freight charges and all other expenses involved in collection of defective components and equipment from the Site, and transportation to the manufacturer's works in India or abroad and its return to Site after repairs. Further, should any design modification be required to any component or equipment as a consequence of failure analysis, the minimum period of warranty i.e. 24 months shall recommence from the date when the modified part is commissioned into service and modification shall be carried out free of charge. In all such cases, warranty will be applicable on complete sub-assembly; even when only component has been modified/replaced/repaired due to design change.

5.2.6. All replacement and repairs under the warranty shall be carried out by the Contractor promptly and to the complete satisfaction of the Engineer on notification of the defect by the Engineer so that no car is unfit for revenue service for more than 48 hours, which shall exclude time taken for withdrawal/induction of trains from/to revenue services. In case any

train remains out of revenue operation beyond specified duration above due to reasons attributable to contractor, Engineer may at his sole discretion impose a penalty on the contractor, commensurate with the revenue and opportunity loss to the Engineer. Decision of Engineer shall be final and binding.

5.2.7. The Engineer will notify the Contractor in writing of any defect together with a brief description thereof. Upon receipt of such notice, the Contractor shall within a reasonable period of time and at his own costs remedy this defect. If within reasonable time, the Contractor fails to full fill his obligations after a reasonable amount of trials for repair (at least three trials), the Engineer may fix by written notice a reasonable final time for completion of the Contractor's obligations. In case the Contractor fails to fulfil his obligations within such final time, the Engineer may himself undertake the necessary repair works employ a third party to do so, always at the risk and expense of the Contractor.

5.2.8. The warranty period of unit exchange, mandatory and overhauling spares, special tools, testing and diagnostic equipment, special jigs, fixtures and gauges, or any other item / equipment delivered shall be :

- either 24 months from the date of acceptance
- or up to expiry of the defect liability period of trains (clause 5.1.2), whichever is later.

5.3. Specific warranty in case of Serial or Hidden defects

5.3.1. The aim of this chapter is to define specific warranty requirements for serial and hidden defects including modifications, parts and labour. Serial or Hidden defects will be covered by a specific warranty period over the general warranty period as defined above.

5.3.2. Serial or Hidden defect is defined as an identical failure on a part or components which occurs on at least 15 % of total identical part and components with the same function of the rolling stock fleet during the General Warranty period. The occurrence of serial defects is calculated with the personal computer based Failure Reporting and Corrective Action (FRACAS) System in charge to demonstrate compliance with specified train and equipment reliability as required in Chapter 19 of the Engineer's Requirements – Technical Specification.

5.3.3. In the case of Serial or Hidden defects, the Contractor shall investigate all the concerned parts and present a technical solution or modification including spare parts modification or replacement for all the metro train fleet including the metro trains no more covered by the General Warranty period (Acceptance certificate signed). The Serial or Hidden defects shall be repaired by the Contractor free of charge (modification, material and labour).

5.3.4. In the case of Serial or Hidden defect, a period of specific warranty of 24 months shall recommence from the date when the modified part is commissioned into service (including spare parts) and modification carried. In all such cases, specific warranty will be applicable on complete sub-assembly, even when only one component has been modified/replaced/repaired due to design change.

6. OPERATION AND MAINTENANCE MANNUAL

6.1. General

6.1.1. The Contractor shall provide Operation and Maintenance manuals, for use by supervisory, operating and technical staff of KMRCL in English.

6.1.2. Thirty days before the date of commencement of test running of the first Metro train, the Contractor shall deliver the originals and 6 coloured copies each of the Operation and Maintenance manuals. Those manuals shall be in a state where the Operation and the Maintenance of the trains can be performed. These manuals shall have been submitted for proof reading and training purposes prior to delivery. It is accepted that further amendments may subsequently be required, should errors be found during operation or maintenance, for the purpose of optimisation of the procedures, or should modifications be implemented by the Contractor following defects.

6.1.3. Each and every manual shall be divided into indexed sections explaining the subject matter in logical steps. Most manuals shall consist of A4-size printed sheets bound in stiff-cover wear-resistant binders clearly and uniformly marked with the subject matter and reference number. Where alternative sizes are proposed, (e.g. A5/A6 pocket books of schematic wiring diagrams) these shall be for review and acceptance. The binding shall allow for all subsequent changes and additions to be readily effected.

6.1.4. Information shall be provided in pictorial form wherever whenever possible and shall include step-by-step instructions and views of the particular equipment including exploded views. Programmable equipment shall be supplied with sufficient flow charts and fully documented programmes to enable faults to be quickly identified and system modification to be undertaken at any time.

6.1.5. The Contractor shall provide clarifications and amendments to the Operation and Maintenance manuals as necessary during the execution of contract. Updates shall be provided for the originals and all copies.

6.2. Operation Manuals

6.2.1. The Contractor shall provide operation manuals explaining the purpose and operation of the complete system together with its component subsidiary systems and individual item of equipment. The characteristics, ratings and any necessary operating limits of the Equipment and Sub-systems shall be provided.

6.3. Maintenance Manuals

6.3.1. The Contractor shall provide maintenance manuals showing details of all the various systems and sub-systems from a maintenance and fault finding standpoint, with particulars of operating parameters, tools for dismantling and testing, methods of assembly and disassembly, tolerances, repair techniques and all other information necessary to set up a repair and servicing programme.

6.3.2. The Contractor shall provide documentation for all hardware and software for computer systems and other associated electronic equipment to meet the following requirements. Such documents shall include but not be limited to:

(i) manufacturers' documentation supplied as standard with the equipment;

(ii) hardware configuration with details of expansion capabilities and options;

(iii) programme loading instructions, including runtime environment configuration;

(iv) for operation or maintenance related applications and under restriction of IPR : programme listing including comprehensive 'comment statements' in hard copy and soft format for source code, compilers and development tools necessary to modify and recompile software;

(v) flow charts, data flow diagrams and state diagrams as appropriate;

(vi) description of software modules including purpose, linkage with other modules, error routines and any special considerations;

(vii) NOT USED;

(viii) loading and operating instructions for diagnostic programmes and specifically developed debugging tools; and

(ix) NOT USED.

6.3.3. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage. The manual shall also include inspection/overhaul procedure and periodicity of various inspection/overhaul schedules in detail including the tools, special tools/plants, and facilities required. The manual shall be subject to review by the Engineer.

6.3.4. A preliminary maintenance schedule specifying the frequency of inspections and the scope of work during such inspections, including facilities, manpower and down-time required shall be included within the Tender.

6.3.5. The maintenance manual shall also include an illustrated parts catalogue of all plant supplied and shall contain sufficient information to identify and requisition the appropriate part by maintenance staff. The catalogue shall comprise 3 sub-sections.

The first sub-section shall be an alphanumeric parts list, which shall include the following information:

(i) Part number

(ii) Description

(iii) Name of manufacturer

(iv) Quantity and Unit

(v) Part number of next higher assembly (usually a line replaceable unit).

(vi) Cross-reference to figure number.

(vii) Category: e.g. consumable, line replaceable unit, repairable.

(viii) Life-expected life, Mean time between failure or mean distance between failure where available.

(ix) Purpose of the part.

The second sub-section is a series of illustrations to indicate the location of each replaceable item, which shall be clear and progressive with exploded views to enable parts to be identified easily by cross-reference with the alpha-numeric list.

And the third sub-section, an indicative price list which shall list in alpha-numeric sequences the part number with the price, lead time and vendor.

6.4. Electronic Manuals

6.4.1. The Contractor shall provide manuals in electronic format. This is in addition to the submission of manuals in hard-copies.

6.4.2. The format of the electronic copies shall be proven in at least two other applications and shall allow for links between parts catalogue and maintenance instructions.

6.4.3. The Electronic manual will be required to be interfaced and integrated with the Maintenance Management Information System programme supplied by other contractor.

6.4.4. The Documents Management System and Language used shall be subject to Engineer's review.

7. SOFTWARE MANAGEMENT AND CONTROL

7.1. Prescriptive Framework

7.1.1. All software to be developed or modified (re-engineered software) shall follow the standardisation requirements of EN 50128 (Railway Applications: Software of Railway Control and Protection Systems). The contractor shall define within the Software Quality Assurance Plan what techniques and measures are to be applied for software development.

7.1.2. The Plan shall require the Contractor to provide all changes, bug fixes, up-dates, modifications, amendments and new versions of the programs, as required by the Engineer. The Engineer may also direct to provide the copy of previous version of software till such time the new version of software is proven.

7.1.3. The Contractor shall provide all tools, Laptop computers or any special device to upload / download the software, TMS data, equipment, manuals and training necessary for the Engineer to maintain and re-configure all software provided under this Contract. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage.

7.1.4. When a fault is discovered in delivered software, or an error in the associated documentation, the Contractor shall take the necessary steps to rectify such faults and errors at the earliest opportunity. The Contractor shall supply to the Engineer, full details, in writing, as to the nature of the corrective action proposed or taken. These changes shall be documented in the form of Software Engineering Change Proposal (SECP), which shall be got approved from the Engineer. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage.

7.1.5. It will be incumbent upon the Contractor to take responsibility for any changes required to software.

7.2. Software Framework

7.2.1. As defined in EN 50128, all software produced or supplied for the Project shall be subject to a defined quality framework. EN ISO 9000-3 shall be considered appropriate for low criticality software (safety integrity level 0 or 1) whilst the application of a more stringent framework shall be required for higher criticality software (safety integrity level 2 or above). The quality framework requirements for safety integrity level 2 and above are supplementary to the requirements of EN 50128.

7.3. Software Management Control

7.3.1. The Contractor shall ensure a full time Software Project Manager and Software Quality Manager are appointed for software development, if software development or modifications are required under the Contract.

7.4. Auditing

7.4.1. The Engineer may carry out an audit of the Software. Further external independent audits may also be arranged at the Engineer discretion.

7.5. Software Acceptance

7.5.1. The Contractor also shall submit an Operational Safety Report (Software) for software acceptance by the Engineer.

7.5.2. The Operational Safety Report (Software) shall include, as a minimum

(i) OSR(S) – Introduction.

Shall describe the nature of software sufficiently to ensure that the Engineer is given a comprehensive overview of primary characteristics such as structure, functions, criticality, volume and language.

(ii) OSR(S) - Evidence of Quality Management.

Shall provide evidence to demonstrate that the software development has been subject to acceptable quality assurance.

(iii) OSR(S) - Evidence of Safety Management.

Shall provide evidence to demonstrate that the software development has been subject to acceptable safety management.

(iv) OSR(S) - Technical Report.

Shall describe how software integrity has been achieved.

(v) OSR(S) - Operation and Maintenance Report.

Shall describe the Software operation and maintenance characteristics.

(vi) OSR(S) - Restrictions for Use.

Shall define what restrictions are applied to the use of the software.

7.6. Availability of Source Code and Development Tools

7.6.1. With the exception of commercial, "Off the Shelf" Software, the Engineer shall be provided with access to full software documentation including source code listings and development tool details. For such commercial software the Contractor shall provide all available documentation for the application and maintenance of that software. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage.

7.6.2. Complete documentation along with the software to be supplied by the Contractor, as above, shall comprise of Signal flow diagram, detail of signals, interpretations so as to enable KMRCL to debug and implement vehicle level modifications, if considered necessary and to interface peripheral items with the vehicle software. KMRCL engineers shall be fully trained and made conversant with the software and other related issues as found necessary during the contract execution to enable KMRCL to operate, maintain, and repair/overhaul of the metro trains efficiently.

7.6.3. After loading, and the satisfactory functioning of the software, the Contractor shall supply two back-up copies of the software, including any new versions adopted. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage.

7.7. Re-Use of Existing Software

7.7.1. Where existing software (defined to module level) is to be re-used without modification, the Contractor shall provide acceptable evidence to the Engineer as to why that software is suitable for use in the proposed application. This evidence may be historical (certified evidence of previous satisfactory use in a similar environment and application), or it may be sought as cross acceptance from another railway authority or statutory body. Software re-use shall not be acceptable, without detailed review, where the proposed application is of the same or lower safety integrity level than the current application.

7.8. Re-Engineered Software

7.8.1. Re-engineered software may be used for applications at all safety integrity levels where the proposed application is of the same or lower safety integrity level than the current application. However, this shall be subject to quality assurance testing as defined above.

7.9. Test Software

7.9.1. All test software, with the exclusion of built-in test software, shall be produced in accordance with a quality system controlled under the requirements of accepted international standards. Test software shall be developed and documented using structured techniques and shall be designed to be maintainable throughout the duration of the Contract. All test software shall be documented to be supportive of maintenance. Any test software, which is to be delivered to the Engineer (for long term testing use), shall be fully documented including source code listings to allow the Engineer to maintain the software for the life of the supported system.

7.10. Software Rights

7.10.1. The Contractor shall ensure that the Engineer or its licensee is granted all necessary rights to use Software embodied in the equipment and there are no restrictions attached to the use of any information supplied by the Contractor which might later prevent or hinder the Engineer or its licensee from modifying or adopting or extending the system. The documentation of software may be supplied after the expiry of the warranty period, under terms and conditions to be mutually agreed at Contract pre-award stage. The Contractor shall indemnify the Engineer, its heir or Licensees against claim of any party, sub-contractor for the unauthorised possession or use of the software supplied. Contractor to give the required software for Programme Development, installation and commissioning of (i) Simulator to be supplied by other contractor; and (ii) Maintenance Management Information System programme supplied by other contractor.

8. SUPPLY OF SPARES, SPECIAL TOOLS AND TESTING EQUIPMENT

8.1. General

8.1.1. The Contractor shall supply the following items of spares:

(i) Unit Exchange Spares;

(ii) Consumable spares for maintenance of all trains during commissioning, service trials and up to completion of Warranty period;

(iii) Mandatory spares;

(iv) Recommended spares;

(v) Overhauling spares;

(vi) Special tools, Testing and Diagnostic equipment;

(vii) Special Jigs, Fixtures & Gauges required for maintenance, repair and overhaul of various equipment, sub-systems in particular and the complete trains in totality

8.1.2. The relevant list of the spares mentioned above (and listed in the tables of the Volume 6 – Pricing Document) shall be submitted in the Tenderer's Technical Submission Documents with prices masked. The financial bid shall be completed and inclusive of ALL pricing details.

8.2. Unit Exchange Spares

The Contractor shall supply the Unit Exchange Spares for as listed in the Volume 6 of "Pricing Document". The Unit Exchange Spares shall be supplied in the Depot. The delivery requirements of different lots are mentioned in the volume 6. These shall be delivered as per the key dates defined.

8.3. Consumable Spares

8.3.1. The consumable spares shall include lubricants, oils, greases, sealants, brake pads/shoes, filter medias, gaskets, lamps, wearable parts like pad for disc brake etc. and any other item, whose declared life is less than one year. Consumable spares should be able to be sourced from Indian suppliers.

8.3.2. The Tenderer shall provide a recommended list of consumable spares as noted above for maintenance, repairs and overhaul of trains.

8.3.3. Any consumable item if required but not included in the above recommended list by the Tenderer will be deemed to have been included and shall be supplied as per the provisions of this contract without any extra financial implication to the Engineer.

8.3.4. Contractor will be required to supply the requisite quantity of spares, as required irrespective of the quantities indicated by the contractor in the recommended list. Engineer's decision in determining any particular item(s) as consumable in line with 8.3.1 above will be final and binding.

8.3.5. In case any changes are required in the supply of consumables on account of changes at design stage, the contractor shall have to supply the required consumables within the quoted cost. No increase/decrease in quoted cost shall be made due to any change in the list of consumables arising due to change/modification of design.

8.3.6. Unpriced list of consumable spares shall be furnished by the Tenderer in the Technical Package.

8.3.7. The consumable spares shall be stored at Central Park Depot (CPD).It shall be the responsibility of the contractor to maintain sufficient stock of consumable spares at CPD of different lines.

8.3.8. Recommended list shall be furnished by the contractor as part of design submission for respective systems and subsystems.

8.3.9. The Contractor is to identify and provide details of local source India suppliers to KMRCL for all of the consumable, with their list prices.

8.3.10. Contractor will furnish complete details during contract execution(detailed design stage) as noted below for the listed spares;

(i) Names, addresses, telephone numbers and other particulars of manufacturers and their local representatives;

(ii) Models and part numbers,

(iii) Full description of spares including a note whether it is sealed unit or an assembly or sub-assembly which can be broken down into component parts;

(iv) Quantity installed in the system;

(v) Overall dimensions and weight including minimum packing (if any) for shelf space purposes;

(vi) Interchange-ability or otherwise with similar parts;

(vii) Normal manufacturing and shipment lead times;

(viii) Designed life.

8.4. Mandatory spares

8.4.1. The Contractor shall supply the Mandatory Spares as listed in the Volume 6 of Pricing Document. The spares shall be supplied in the Depot nominated by the Engineer. The items and quantity required are mentioned in the list in Volume 6. The price of these spares shall be quoted at actual.

8.4.2. No change in quoted cost of any spare will be allowed even when there is change in design of any equipment/sub-system during execution of the contract.

8.4.3. Contractor will furnish complete details during contract execution (detailed design stage) as noted below for the listed spares;

(i) Names, addresses, telephone numbers and other particulars of manufacturers and their local representatives;

(ii) Models and part numbers

(iii) Full description of spares including a note whether it is sealed unit or an assembly or sub-assembly, which can be broken down into component parts;

(iv) Quantity installed in the system;

(v) Overall dimensions and weight including minimum packing (if any) for shelf space purposes;

(vi) Designed life;

(vii) Interchange ability or otherwise with similar parts;

(viii) Normal manufacturing and shipment lead times;

8.5. Recommended spares

8.5.1. The Tenderer shall furnish priced list of the recommended spares, not covered under consumables and mandatory spares but are expected to be required during two years after expiry of Warranty period, along with the bid as per format enclosed in Appendix 6 of this Engineer's Requirements - General Specification. The Spares shall be supplied in the Depot nominated by the Engineer.

8.5.2. Contractor shall supply of all the spares recommended by equipment/sub-system manufacturers within the quoted cost for recommended spares. Contractor shall furnish list of spares recommended by equipment/sub-system manufacturers at design submission stage.

8.6. Overhauling Spares

8.6.1. Contractor shall supply the overhauling kits for five (5) metro trains. The price of overhauling kits for these trains shall be included in the contract. Overhauling kits for all those equipments, systems, sub-systems of trains that will need overhauling during intermediate overhaul of the train will be included in these kits. The Tenderer shall submit the list of such kits and if possible the details of the items in the kits in technical offer.

8.6.2. Tenderer shall quote the price of the kits at actual price (not an apportioned price). The value of these spares shall form part of the evaluation. Employer may make further procurement of such kits at the quoted price.

8.7. Special Tools, Testing and Diagnostic equipments:

8.7.1. The Tenderer shall provide a recommended list and supply one (1) set of fixed and two (2) sets of portable and hand held Special Tools, Testing and Diagnostic Equipment for preventive and breakdown maintenance, overhauling and diagnostics of various equipment provided in the cars. The unpriced list of set of such equipment together with the details and description of such equipment shall be furnished along with the bid in the technical package.

8.7.2. Any Special Tools, Testing and Diagnostic Equipment required for preventive and breakdown maintenance, overhauling and diagnostics of various equipments and recommended by OEMs shall be included in the recommended list by the Tenderer. The Contractor within the quoted cost shall supply any items that are not specifically included by the Tenderer in the recommended list but is recommended by the OEMs. List of items recommended by the OEMs shall be furnished as part of detailed design submission.

8.7.3. All items of Special Tools, Testing and Diagnostic equipment supplied by the Contractor, shall be accompanied by drawings, manuals and full operating instructions to enable them to be used by suitably skilled (but not necessarily specially trained) personnel in a non-hazardous manner and to achieve the desired result in terms of accuracy and quality. Each set of these equipments will be provided along with individual set of these drawings, manuals and full operating instructions.

8.7.4. The Contractor shall provide the means and instructions which describe the parameters of each item of Special Tools, Testing and Diagnostic Equipment that are critical to their proper methods of use and which enable the staff using the equipment to achieve the proper performance and operation. Such means and instruction shall include, but not be limited to any routine checking or re-calibration, needs for the tool or test equipment itself. Demonstration of the use of these special tools, testing and diagnostic equipments to the satisfaction of the Engineer shall be provided by the contractor.

8.7.5. Relevant details of Special Tools, Testing and Diagnostic equipments on the same lines as asked for mandatory spares above shall be furnished by the contractor.

8.8. Special Tools, Jigs, Fixtures and Gauges

8.8.1. The Contractor shall provide a sufficient number of all special tools required to enable the Employer to properly maintain the trains. These tools shall include but not limited to special assembly/disassembly Jigs, test benches, handling tools, equipment mounting/dismounting tools and other tools considered particular to the Vehicle and its equipment.

8.8.2. The Contractor shall provide diagnostic test equipment to ascertain the functionality of all discrete pieces of specialized equipment. This equipment shall consist of embedded fault monitoring and diagnostic system, portable test equipment and shop test equipment.

8.8.3. The portable test equipment shall consist of a suitable number of pre-programmed laptop computers and standard cable connectors as approved by the Engineer. The Portable Test Units (PTU) shall be connectable to the equipment to be tested, allowing faults to be quickly and easily diagnosed and allow data download and analysis. Connection points shall be provided both on the inside and exterior of the cars as may be appropriate to quickly diagnose faults with associated systems, and the locations of these test points shall be approved by the Engineer. Portable test equipment shall be provided for each major vehicle system including all interface software and hardware. Test capability should include but not limited to measurement of major vehicle parameters, such as traction current, tractive effort, speed and others, both in static and dynamic condition.

8.8.4. The shop test equipment shall consist of at least one set of test benches for each major vehicle system, whereby the equipment to be tested is removed from the vehicle and loaded onto the test bench. The tester shall allow all faults to be easily and quickly diagnosed. Each test unit shall be completely wired and shall use 220 Vac, 60 Hz single phase power and compressed air, as may be appropriate.

8.8.5. The Contractor shall provide sufficient number of pieces of this equipment to allow the Employer to properly maintain and repair the trains. The number of test equipment shall be approved by the Employer/Engineer, based on an operational analysis to be performed by the Contractor.

8.8.6. The Tenderer shall provide a recommended list and supply, as minimum, one (1) set of fixed Special Jigs, Fixtures and Test Benches and two (2) sets of hand held and portable tooling, measuring and diagnostic equipment and Gauges separately for preventive and breakdown maintenance, overhauling and diagnostics of various equipments provided in the cars. The unpriced list of such equipment together with the details and description of such equipment shall be furnished along with the bid in the technical package.

8.8.7. Any Special Tools Jigs, Fixtures and Gauges required for preventive and breakdown maintenance, overhauling and diagnostics of various equipments and recommended by OEMs shall be included in the recommended list by the Tenderer. The Contractor within the quoted cost shall supply any items that are not specifically included by the Tenderer in the recommended list but is recommended by the OEMs. List of items recommended by the OEMs shall be furnished as part of detailed design submission.

8.8.8. All items of Special Jigs, Fixtures and Gauges supplied by the Contractor, shall be accompanied by drawings, manuals and full operating instructions to enable them to be used by suitably skilled (but not necessarily specially trained) personnel in a non-hazardous manner and to achieve the desired result in terms of accuracy and quality. Each set of these equipments will be provided along with individual set of these drawings, manuals and full operating instructions.

8.8.9. The Contractor shall provide the means and instructions which describe the parameters of each item of Special Jigs, Fixtures and Gauges that are critical to their proper methods of

use and which enable the staff using the equipment to achieve the proper performance and operation. Such means and instruction shall include, but not be limited to any routine checking or re-calibration, needs for the tool or test equipment itself. Demonstration of the use of these special tools, testing and diagnostic equipments to the satisfaction of the Engineer shall be provided by the contractor.

8.8.10. Relevant details of Special Jigs, Fixtures and Gauges on the same lines as asked for mandatory spares above shall be furnished by the contractor.

8.9. Manufacture, Delivery and Warranty

8.9.1. The major spare parts ordered under the Contract shall be manufactured, works tested and inspected in accordance with the relevant quality system, suitably packed and labelled in accordance with Chapter-9 of this Engineer's Requirements General Specification "Storage, Packing, Crating and Marking" and delivered by the Contractor to the depot as directed by the Engineer .

8.9.2. All spares shall be subject to inspection by the Engineer. In the event that any item is known to be going out of production, then the Contractor shall give advance notice to the Engineer.

8.9.3. The warranty period of unit exchange, mandatory and overhauling spares, special tools, testing and diagnostic equipment, special jigs, fixtures and gauges or any other item / equipment delivered shall be:

(i) either 24 months from Taking Over or

(ii) up to expiry of the defect liability period of trains whichever is later.

8.10. Purchase of Spares from Vendors

8.10.1. The Contractor shall furnish an undertaking that he has no objection whatsoever to and shall not in any way deter or obstruct the Engineer, its licensee or its representative from dealing directly with the Contractor's Vendors for the purchase of the spares during the Contract period. The spares purchased shall be subject to inspection by the Engineer.

8.10.2. Contractor shall obtain an undertaking from vendors, OEMs etc. at detailed design submission stage that they will deal directly with Engineer for supply of spares, equipments and/or sub-systems.

8.11. Commissioning and Warranty Spares

8.11.1. The Tenderer shall submit to the Engineer for review a list of minimum spare parts that he intends to make available during the installation, commissioning and defect liability periods.

8.11.2. The Contractor shall keep on Site, at his own cost, throughout the installation, commissioning and defect liability periods, stocks of spare parts, as per the list to enable rapid replacement of any item found to be defective or in any way in non-conformance with the Specification.

8.11.3. The Contractor shall not be entitled to use any of the Employer's spare parts during the installation and commissioning periods or during the Defects Liability Period.

8.11.4. Contractor shall not be permitted to remove any working/healthy equipment / components / sub-systems / systems from any of the train available at the depot for any reason whatsoever.

8.11.5. Spares as per the agreed list shall be supplied in accordance with Milestone Dates.

8.11.6. Stocks of such spares as available in Contractor stores will be jointly checked with the Engineer every three months.

8.11.7. Certificate by the Engineer confirming availability of the spares in contractor stores in the Depot as per agreed list will be a pre-requisite for release of interim payments of the Contractor. However, this condition will not be applicable for six months before the expected expiry of the Defects Liability Period.

8.12. List of Spares

8.12.1. The Tenderer shall furnish an unpriced list of spares for maintenance, overhaul and repair of cars separately (if there are differences in items) for a period of ten years from the date of taking over of the last trains in the Technical Package. The spares shall be in kit form. The Tenderer shall also quote unit prices for the kit of spare at the Depot along with escalation clause in the Financial Package.

8.12.2. The Contractor shall ensure availability of spare parts for a period of ten year from the last date of taking over of whole of Works The Engineer at his discretion, during a period of ten years from the date of taking over of the whole works, purchase as many kits of spare parts as required by him, at the rates indicated in this schedule.

8.12.3. If during the period of ten years, the Contractor intends to discontinue the manufacture of spare or replacement parts for the Rolling Stock, the Contractor shall immediately give notice to the Engineer of such intention. The Engineer shall be given the opportunity of ordering at reasonable prices such quantities of such spare or replacement parts as the Engineer shall reasonably require in relation to the anticipated life of the Rolling Stock.

8.12.4. In the event of Contractor failing to supply the spare parts in accordance with this Clause, he shall in respect of each item of spare, furnish free of cost to the Engineer, the drawings, specifications, patterns and other information to enable the Engineer to make or have made such spare parts. The Engineer shall be entitled to retain the aforesaid drawings etc., for such time only as is necessary for the exercise by the Engineer of his rights under this clause and the drawings, if the Contractor so requires, shall be returned by the Engineer to the Contractor in good order and condition (fair wear and tear excepted).

8.12.5. Under such circumstances, the Contractor shall also grant to the Engineer, without payment of any royalty or charge, full right and liberty to make or have made spare or replacement parts as aforesaid and for such purposes only to use, make and have made copies of all drawings, patterns, specifications and other information supplied by the Contractor to the Engineer pursuant to the Contract.

8.12.6. The Contractor will so far as it is reasonably able to bind his sub-contractors to conform with the requirements of this Clause and shall, prior to entry into any sub-contracts, provide the Engineer with full details of any sub-contractor who will not so conform in which event the Engineer may direct the Contractor to seek an alternative sub-contractor.

8.12.7. If the Contractor fails to provide spare or replacement parts as described in this Sub-clause and these are available from the Contractor's sub-contractor, the Engineer shall have the right to obtain such spare and replacement parts from the sub-contractor or any other Contractor and any additional cost incurred by the Engineer shall be recoverable from the Contractor.

8.12.8. In case the Contractor is unable to supply spares in accordance with Clause above, he shall furnish, free of cost to the Engineer, the drawings, specifications, and other technical details,

to enable the Engineer to manufacture parts, or have them manufactured. Such drawings and technical data shall be provided free of any charge or royalty, on the understanding that the Engineer will use such data and drawings, only for the manufacture of parts for his own use.

8.12.9. The foregoing shall hold equally good for the Contractor, any or all of his sub-contractors, and vendors.

8.12.10. In the event that technological progress results in improved versions of spares and replacement parts, the latest version shall have the same plug compatibility, and spatial needs of its predecessor, to avoid modifications being required, to accept the up-graded version of the part.

9. STORAGE, PACKING, CRATING AND MARKING

9.1. General

9.1.1. The Contractor shall be fully responsible for the provision and maintenance of acceptable storage facilities for the Plant and any materials or equipment he intends to use for the carrying out of the Works.

9.1.2. The Contractor shall prepare, protect and store in a manner to be acceptable to the Engineer , all 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. Secure and covered storage shall be provided for all equipment and materials other than those accepted by the Engineer as suitable for open storage.

9.1.3. The Contractor shall provide all packing, crating and markings. In so doing he shall comply with the following requirements:

(i) All packing procedures shall be subject to acceptance by the Engineer.

(ii) Spare parts shall have packing for prolonged storage in accordance with BS 1133 or equivalent and shall be suitably labelled to indicate :

- Ownership
- Shelf life.
- Type of storage.
- Description of item and relevant part number.
- Serial number, if applicable.
- Inspection Certificate number and batch number, that is, the number allocated by the Contractor's Inspector at the time of manufacture or packing.

(iii) Protection requirements shall include but not be limited to:

- Electrical and other delicate items or equipment shall be properly protected to the Engineer acceptance.
- Tube ends, cable ends, cable entry points into equipment and other similar terminations and openings shall be blanked off to prevent ingress of dirt, moisture, vermin or insects and to provide protection against damage.
- Flanged ends shall be protected by adhesive tape or jointing material covered by a properly secured wooden blank not smaller than the flange itself. Plain tube ends shall be closed off with bungs or plugs or suitable materials firmly fixed in position.
- Particular care shall be taken to prevent damage to or corrosion of shafts and journals where they rest on timber or other supports, which may contain moisture. At such points, wrappings impregnated with anti-rusting composition shall be used. Wrapping shall be of sufficient strength to resist chafing under the pressures and movements likely to occur in transit.
- Spare ball and roller bearings and similarly protected items shall not be removed from the manufacturer's wrappings or packing.

(iv) Each case, crate or package shall be legibly and indelibly marked in large letters with the name , address, Contract Number, "right way up", opening points and other markings as necessary to permit materials and Plant to be readily identified and handled during transit and when received at Site.

(v) Each case, crate or package shall contain a comprehensive packing list showing the number, make, size weight and contents together with any relevant drawings. A second copy of the packing list shall be enclosed in a watertight enclosure on the outside of each case.

(vi) All items heavier than 100 kg shall be marked on the outside of the case to show the gross and net weights, the points for slinging, and where the weight is bearing.

(vii) Care shall be taken to prevent movement of equipment within cases, crates or packages by the provision of bracings, straps and securing bolts as necessary. Bags of loose items shall be packed in cases and shall be clearly identified by well-secured labels on which the quantity and name of the part and its index or catalogue number have been stamped.

(viii) In order to reduce fire risk and prevent obstruction, all empty cases, crates, or packages whether or not returnable shall be removed from the Site as soon as possible. If this requirement is not complied with, after due notice, the Engineer will instruct others to remove them and the Engineer will deduct from the Contractor's payment for the costs incurred together with handling charges.

9.1.4. If sea transportation of metro trains from manufacturer's works to site at Kolkata is required, seaworthy packing/ treatment of Trains shall be carried out for the safe transportation of trains. It shall apply to sea transportation of spares and other materials also.

10. TRAINING

10.1. Training Requirements

10.1.1. The Tenderer shall include and price in his tender submission a Training proposal to meet the following requirements:

(i) Training of Employer's Driving Instructors and Drivers (4 man months) in operation of Trains off –shore or in Contractor's Works and on his test track off-shore.

(ii) Training of Employer's maintenance personnel (15 man months) in Contractors / sub-contractor's Works and Metro Rail Transport System (MRTS) off-shore.

(iii) Provision of Contractor's Driving Instructors (2 man months) for Training of Employer's operating personnel in India.

(iv) Provision of Original Equipment Manufacturer (OEM) Experts / Instructors (40-man month) for Training of Employer's maintenance personnel in India.

(v) Submission of Training Manuals (Original plus five hard copies) and in Electronic format.

10.1.2. The Tenderer shall list the cost for each component module of the Training in terms of man-months in Financial Package. The travel, boarding and lodging expenses for the Employer's trainees will be borne by the Employer. The Employer may at its absolute discretion delete any or all of the training modules while accepting the tender.

10.1.3. Facilities such as classrooms, overhead projectors, VCRs and video monitors will be made available for imparting training in Employer's depot in India free of cost to the Contractor. However, for training in the Contractor's works, such facilities shall be arranged by the contractor's at his own cost. The Contractor is however, required to provide at his own cost all other necessary training aids such as written and printed notes, video programs, transparencies, slides, films, models and drawings, and other training aids etc.

10.1.4. The Employer's personnel required to undergo training will be qualified electrical, mechanical and electronics engineers, technicians, supervisors or instructors, with relevant practical experience. The training syllabus should therefore concentrate on familiarisation with particular systems and equipment of the cars and technologies outside of their experience.

10.1.5. Training Instructors provided by the Contractor shall be fully qualified and experienced electrical, mechanical and electronics engineers and experts in the relevant field with experience in training of engineering graduates and technicians to the level of competency essential for operation and maintenance of Metro trains of similar specifications. The Instructors shall be preferably English speaking. If any interpreter is required, it shall be arranged by the contractor at his cost. The appointment of Instructors shall be confirmed only after his detailed curriculum vitae have been accepted by the Employer. In the event that an Instructor is subsequently deemed not to be competent, he shall be replaced forthwith.

10.1.6. The Contractor shall submit a detailed Training proposal in the Technical package to meet the above requirements.

10.2. Training Objectives: Train Operating Staff

10.2.1. The objective of training of train operating staff is that the batches of drivers and instructors who will operate the trains should be able to run the trains safely under all operating conditions. The training should also enable them to acquire full capability for identification and trouble shooting of the faults in the specified duration. In order to achieve the above objective, the Operating Staff and instructors should be trained on a cab simulator of a mass

transit railway or in the Contractor's Works off-shore and on a Test Track. It will be preferred that after classroom instructions, which include mock-ups of cab equipment, the staff are trained in actual operation of cars in a Mass Rapid Transit System or on a test track, having similar cars, to acquire the required confidence.

10.2.2. The Contractor's Instructors deployed for training of operating Staff in India shall provide training in classroom, as well as actual driving of trains during and after commissioning of trains in India. The instructors shall also train the operating staff in trouble shooting of the faults and emergency procedures.

10.3. Training Objectives: Maintenance Staff

10.3.1. The training should enable the engineers, inspectors and staff to achieve the following broad objectives:

(i) Full understanding of all aspects of the system design and functions of all the equipment including proprietary and third party equipment, software etc.

(ii) Full understanding of all aspects of program maintenance and overhaul requirements of cars and equipment.

(iii) Procedures to be followed for unscheduled maintenance and repair of cars and equipment.

(iv) Identification of failed components and sub-systems in electronic equipment by use of special test equipment, as necessary.

(v) NOT USED.

(vi) The engineers, inspectors and staff shall be trained to understand and handle all operation and maintenance related data issued by the rolling stock and transmitted by it to the portable maintenance terminals.

(vii) Monitoring and scheduling trains in the Progress Planning and Investigation Organisation.

(viii) Stores inventory planning and control.

10.3.2. The training of Employer's personnel off shore shall include direct exposure to engineers, technicians, inspectors and staff in actual repair, maintenance and overhaul of similar cars in the Depot and Workshop of an operational Metro Rail Transit System.

10.3.3. The Contractor's Instructors deputed to train Employer's personnel in India shall impart theoretical as well as practical training so as to enable them to develop skill and expertise necessary for satisfactory maintenance, repairs and overhaul of cars.

10.4. Training Methods

10.4.1. As a general guide, training shall be based upon a "two-stage" concept:

10.4.2. Stage one shall consist of training in the basic concepts and principles. These shall include system configuration and specification, operation and control of all equipments installed in the cars, preventive maintenance procedures, overhaul and repair concepts, fault diagnostic and trouble shooting and emergency procedures. The training shall consist of class room (theory) training; computer based inter-active training and mock-up training.

10.4.3. Stage two shall consist of "hand-on" site-based practical training on preventive and corrective maintenance and operating procedures.

10.4.4. The contractor shall also include the training of the staff in the correct procedures of maintenance and repair of different equipment based on the Training Manual supplied against the contract.

10.4.5. Contractor shall arrange the experts from the OEMs of the systems to impart the "hands on" training at site for the agreed durations during the contract execution.

10.4.6. Training evaluation shall be carried out at regular intervals to monitor the progress and suitability of the training program, and of the trainees.

10.4.7. The performance of Contractor's Instructors shall also be evaluated by the the Employer at regular intervals.

10.4.8. Contractor shall provide training for maintenance and overhauling of the equipments, which shall cover, as a minimum of following work areas:

(i) Depot Maintenance Management including Documentation.
(ii) Bogie, Brake
(iii) Car body including furnishing
(iv) Doors and associated drives
(v) Lifting of car, assembly/disassembly of equipment
(vi) Traction Motors
(vii) Converter/Inverter and associated controls
(viii) Auxiliary Supply Equipments
(ix) TIMS / Control Electronics
(x) Software handling
(xi) Air-conditioning
(xii) Stores Management
(xiii) Any other area requiring specialist service.

10.4.9. Training Manual

The Contractor shall provide one original, five coloured copies and (2 x electronic interactive format) of the Training Manual for use by the Employer for conducting in-house training. The Manuals shall cover all requirements specified in this chapter.

10.5. Transfer of Training Aids

10.5.1. After completion of the training, training aids and materials used shall become the property of Employer to enable and further training to take place.

10.6. Training Location and Facilities

10.6.1. Training shall be carried out at such locations as will provide the maximum benefit to the trainees. Such locations may be in India, or abroad, at places of manufacture, assembly or testing, or at other locations as may be necessary. All locations proposed for training shall be subject to the consent of the Employer. Details of the facilities proposed to be provided, shall be included within the detailed Training Proposal submitted by the Contractor.

10.7. Administration

10.7.1. The Contractor shall be responsible for the reception and office facilities for the trainees, when in countries other than India.

10.7.2. The Contractor shall be responsible for the general welfare, health and safety of trainees under his control.

11. SITE AND SITE MANAGEMENT

11.1. Access to Site

11.1.1. The Contractor will be given access to the Site in accordance with Clause 2.2 of the General Conditions of Contract.

11.1.2. The Tenderer is advised to visit and examine the Site and surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the Tender and entering into a Contract for the proposed Works. The costs of visiting the Site shall be borne by the Tenderer. It shall be deemed that the Contractor has undertaken a visit to the site of Works and is aware of the site conditions prior to the submission of the tender document.

11.2. Site Facilities

11.2.1. The Contractor will be provided approximately 150 sq m of total space at Central Park Depot for contractor's site offices and stores, for the purpose delivery assembly, testing, commissioning and integration of Metro Trains. (Allocated space is indicated in the Employer's Requirements – General Specifications: Appendix 8)

11.2.2. The assigned space of Cl.11.2.1 will not be available to the contractor before delivery of the 1st/Pilot Metro Train.

11.2.3. The Contractor shall arrange all furnishing, security communications, lockers etc.

11.2.4. Vehicle parking will be made available on site for parking of the Contractor's vehicle's approved for site access by the Engineer.

11.2.5. All buildings shall be supplied with electricity 240V 50Hz that shall be distributed to each room in accordance with the Regulations. Lighting and electrical power points shall be provided to each room. Charges for the electricity consumption shall be payable by the Employer.

11.2.6. Fire fighting equipment shall be provided in accordance with the recommendations of the Kolkata City Fire Brigade.

11.2.7. The Contractor shall provide, erect and maintain appropriate name boards as specified for each of the offices.

11.2.8. The Contractor shall provide his own lifting facilities for unloading of metro cars and any heavy equipment, at the port of arrival, transhipment point and depot.

11.2.9. The Contractor shall be allowed to use any necessary Depot facilities free of charge for assembly, commissioning, inspection, repairs to metro cars and equipment, subject to availability. The Employer shall, however, not be responsible for adequacy, reliability and safety of the facilities provided to the Contractor.

11.2.10. Initial access to be provided to the Contractor at the Depot Facilities shall be the Periodical Overhaul. Access to other facilities such as Test Track, Inspection Bays and Stabling Shed shall be staged accordingly to the other Designated Contractor programs and interface requirements.

11.2.11. Traction power at 750 V D.C will be made available to Contractor free of charge for testing and commissioning. The Contractor shall liaise with Designated Contractors for availing of the power and assuring compliance of all safety procedures.

11.2.12. A test track is installed in depot. It will be available for the testing of first pilot train. The Contractor will be allowed use of the test track free of charge.

11.2.13. The Contractor shall provide his own train drivers for Testing, Commissioning and Service Trials.

11.2.14. Reasonably lit access to the areas approved for Contractor access and cleared for use rail sidings will be provided by others. If Lighting is not provided in the specific areas allocated to the Contractor, he should make his own arrangements.

11.2.15. The Contractor shall be solely responsible for the security and housekeeping of the area, plant and possessions allocated to him. The Contractor shall provide and maintain all facilities required by him in the area allocated for his exclusive use to fulfil his obligations under the contract.

11.2.16. The Contractor shall arrange at his own cost all site services necessary and appropriate for the assembly, testing and commissioning of trains, which shall include, but not necessarily be limited to:

(i) Electricity at site area (other than traction and inside the shed);

(ii) Compressed air other than the depot facility provided ;

(iii) Communication facilities; and

(iv) Instrumentation.

11.2.17. The Contractor shall be responsible for making applications or requests to the concerned Authorities for availing of the above facilities. In the event that electricity or water supplies are arranged by another Designated Contractor in the Depot area, the Contractor may avail himself of those supplies from the Designated Contractor, either directly on agreed terms and conditions. The Contractor shall comply with all regulations of the utility companies and Government departments concerned.

11.2.18. The Contractor shall allocate at his Works, and those of his major sub-contractors, adequate office space, furniture and equipment for the use of the Employer's Inspection Engineers. The Contractor shall provide an office space at the Manufacturer's site, good for two Engineers, and equipped with complete facilities.

(i) As a minimum, the contractor provided facilities for the use of the Employer's Inspection Engineers at each of the two (2) offices, (Manufacturer's site and KMRCL's Depot site), shall be equipped with the following essential furniture and equipment, and to be available 3 months from NTP..Tables and chairs for two persons.

(ii) Secured locker cabinet (2 units)

(iii) Telephone line with International Direct Dial.

(iv) Fax machine (latest model heavy duty), and

(v) Two latest Computer Set with Internet connection, printers and all peripherals

The computers at the Manufacturer's site shall be transported and ownership transferred to KMRCL after the completion of the work

11.3. Site Management

11.3.1. The Site Management Plan shall be submitted to the Engineer for review within as required within the Key Dates. The Contractor shall:

(i) 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;

(ii) 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;

(iii) 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;

(iv) 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

(v) except where otherwise provided, not permit any person to reside on the Site.

(vi) unless otherwise stated, 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.

(vii) not use any part of the Site or Works for advertising purposes except with the acceptance of the Engineer.

11.3.2. The Site shall be maintained in a clean and tidy condition. Materials, including those required for Temporary Works, shall be stored in an orderly manner. 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 ensure 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

11.3.3. The Contractor shall ensure that gases, fuels, explosives and other dangerous goods are stored and handled in a safe manner and in accordance with the Statutory Regulations pertaining to their storage and handling. The Contractor shall be responsible for obtaining the requisite licences at his own cost.

11.3.4. The Contractor shall provide all necessary protective clothing, safety equipment, hand tools, ladders, trestles, power supply, and replacement equipment for the staff engaged on Site maintenance.

11.3.5. Because of the multi-disciplinary nature of the Project, several different parties may require access to the same portion of the Site during the construction phase, for the installation, erection and testing of the Works. To facilitate the organisation and co-ordination of access and occupation requirements, the Contractor shall maintain a close liaison with other Designated Contractors.

11.3.6. As soon as any or all of the Contractor's installations are no longer required for the execution of the Works, the Contractor shall remove those facilities and ensure that the area is left free of debris, excess materials, and obstructions.

11.3.7. The Contractor shall procure and provide two (2) numbers of vehicles (SUV air-conditioned, with engine capacity of not less than 2000cc, and with seating capacity for 7 persons); for exclusive use of the Employer and the Engineer. These shall be made available within 3 months of Notice to Proceed (NTP)/Commencement Date and maintained and operated by the Contractor in good road-worthy condition till the completion of DLP, after which time the contractor shall transfer ownership to the Employer

11.3.8. Contractor shall provide total four field / office attendant to the Engineer at nominated site office from 3 months of NTP/ Commencement Date to completion of DLP. Contractor shall provide office stationary, photocopier etc throughout the contract period.

11.4. Site Safety

11.4.1. The Engineer will issue to the Contractor with the latest edition of the Project Safety, Health and Environment (SHE) Manual

11.4.2. The Contractor shall as a minimum comply with the SHE Manual. However, this shall not relieve the Contractor of any of his statutory duties, obligations or responsibilities under the Contract. The Engineer reserves the right to order the immediate removal and replacement of any item of Contractor's equipment, which is deemed to be in an unsafe condition.

11.4.3. The Contractor shall submit a Site Safety Management Plan, and also designate a member of his staff as Safety Officer, within the plan.

11.4.4. The Contractor shall establish, maintain and staff, a First Aid Post, at all times when personnel are on site. Portable First Aid Boxes shall be maintained in a fully equipped at each site work centre. The Contractor shall ensure that at least one employee on every working shift, is a trained First Aider, capable of administering First Aid competently until the arrival of professional help, in an accident situation.

11.4.5. The Contractor shall be fully responsible for the safety of the Works, his personnel, his sub-contractors' personnel, the public, and any persons directly or indirectly associated with the Works, or on or in the vicinity of the depot site. The Contractor shall treat safety measures as high priorities in all his activities throughout the execution of the work.

11.4.6. The Contractor shall submit to the Engineer, regular (weekly) Site Safety Reports, and shall notify immediately the occurrence of an accident involving his staff or that of his sub-Contractors, or to any person within the area of the depot for which the Contractor is responsible.

11.5. Proposal for Use of Site and Site management

11.5.1. The Tenderer must submit an "Outline Proposal for Use of Site and Site Management" with the Tender submission, to assist with interface management prior to award of RS(R) Contract

12. TRAFFIC, ROAD & APPURTENANCES

12.1. General

12.1.1. The Contractor shall conform to the applicable requirements of the Motor Vehicle Act - 1988. The Contractor shall ensure compliance with the requirements regarding the licensing of drivers and the registration of vehicles. Vehicle size and load limitations shall be in accordance with all statutory requirements.

12.2. Transportation to Site

12.2.1. The Contractor shall make all arrangements and assume full responsibility for transportation to the site at nominated depot of the Metro Cars, plant, equipment, materials and supplies needed for the proper execution of the Works. Procedures for access to and from the Site shall be co-ordinated with the relevant Authorities, and informed to the Engineer.

12.2.2. A loading / unloading line is to be constructed at Central Park Depot where the metro cars can be brought by road transportation. These facilities may be used after obtaining the Engineer's approval and under the operational restraints..

12.2.3. The Contractor shall use such routes and rights of entry to the Site as may be approved by the Engineer. 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 Paragraph 12.2.1.

12.2.4. The Contractor shall be responsible for obtaining permission from the Traffic Police and other relevant authorities and for arranging police escorts if required.

12.2.5. 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 vehicle or its workmen, scaffolding, plant, materials, equipment, etc. All Workmen working on the road shall wear approved reflective safety vests at all times.

12.2.6. The Contractor shall repair damage caused to existing roads, footpaths, steps, cables, sewers, drains, etc. and shall reinstate the same at his own expense to the satisfaction of the relevant authorities.

13. PUBLIC RELATIONS MATTERS AND PROGRESS PHOTOGRAPHS

13.1. General

13.1.1. The Contractor shall, liaise with Employer, KMRCL, on all press and public relations matters in connection with the Contract.

13.1.2. All press releases, press statements, articles or printed material prepared by the Contractor shall be submitted to KMRCL, in consultation with the Engineer prior to publication or release to the news media. All press queries relating to the Contract received by the Contractor must be referred to KMRCL for clearance, in consultation with the Engineer. The Contractor is not allowed to be interviewed by the press or divulge any information freely to reporters without first seeking clearance from KMRCL.

13.1.3. Use of the KMRCL logo in the Contractor's publications shall be subject to approval of KMRCL.

13.1.4. The Contractor shall provide KMRCL and Engineer with schedules relating to night works, traffic diversions, closure of road etc. that may cause inconvenience to the public.

13.1.5. The Contractor shall extend to KMRCL all the necessary assistance and co-operation with regard to requests for photo-taking, video-taking and visits to the Site by the KMRCL official photographer or appointed film-maker, in consultation with the Engineer

13.1.6. The Contractor shall include a section on matter concerning Public Relation in his monthly report to the Engineer.

13.1.7. All hoardings and signboards put up by the Contractor shall be maintained in good condition.

13.1.8. All public complaints should be thoroughly investigated and acted upon by the Contractor on an urgent basis.

13.1.9. The Contractor shall give full support to all functions and events e.g. community talks for residents, Site visits for the media etc. organised by the KMRCL during the period of the Contract.

13.2. Progress Photographs and Videos

13.2.1. After design, manufacturing and testing activities start, the Contractor shall furnish digital photographs showing the progress of the Works during the month. The actual number of photographs taken and the subjects photographed shall be as directed by the Engineer.

13.2.2. Digital Photographs shall be of .jpeg format (min resolution 1600 x 1200) and Video Recordings shall be supplied in .mpeg format (min resolution 1280 x 720), unless otherwise requested by the Engineer

13.2.3. In case the engineer requests for printed photographs the contractor then three (3) colour prints of each photograph shall be submitted. Prints shall be standard commercial quality on single-weight glossy paper 200mm by 250mm in size inserted back-to-back in clear plastic envelopes made for the purpose. Each photograph shall have a forty millimetres by eighty millimetres title block in the lower right-hand corner, which shall show the following information:

- KMRCL CONTRACT No. :
- CONTRACT NAME :
- CONTRACTOR :
- PHOTOGRAPH No. :
- DATE
- DESCRIPTION :

14. APPENDICES

APPENDIX 1 PROGRAM

1.1. Time-Scaled Network/Bar Chart

1.2. Time Scaled Network/Bar Chart Details

1.3. Work program software

APPENDIX 1- PROGRAM

1.1 Time-Scaled Network / Bar Chart

1.1.1 All programs shall be developed by computerised Critical Path Method (CPM) using the Precedence Diagramming Method (PDM) and shall be presented in either bar chart or time-scaled network diagram format, suitably coloured to enable easy reading. All duration for the purpose of programming shall be in calendar days. All reference to network shall mean time-scaled network unless otherwise specified.

1.1.2 The coding structure shall be such that the activities can be summarised to the various levels. Each level shall be summarised and collapsed to the next level using the programming software. The Contractor shall propose essential codes and activity codes to be used for review of the Engineer. The Engineer may require additional activity codes subject only to restrictions imposed by the programming software. Additional codes where necessary may be created by the Contractor with the approval of the Engineer. Each activity in the network shall be coded, as a minimum, with the following:

(i) Contract number, activity type, and unique identification numbers.

(ii) Activity codes to indicate Unit, Segment, Stage or Phase, for e.g. design, manufacturing, delivery, installation, etc.

(iii) The Contractor shall note that breakdown of system into sub-systems is essential and shall be carried out not through further coding but through activity descriptions in a consistent manner such as to allow storing. However, the Engineer shall have the right to require the Contractor to code sub-systems, using codes approved by him, if necessary.

(iv) Area, location and location details under Activity Code – Unit.

(v) Cost and resources

(vi) Cost and resources codes shall be submitted for the approval of the Engineer. For tender purposes, the Tenderer shall use his own codes.

1.1.3 All logical and necessary relationships between activities shall be shown.

1.1.4 All key dates indicated in the Contract shall be shown. In addition to the key dates, the Contractor may require certain events that are critical to his work to be reflected in his programs. These shall be reflected as "milestones". Appropriate activity codes shall be used to distinguish "milestones" from the key dates.

1.1.5 The level of program development, information and detail shall be sufficient to permit the Engineer to have a good appreciation of the Contractor's project management plan especially with regard to the co-ordination and timing of his work in relation to the work of the other Designated contractors and the obtaining of necessary approvals from the relevant local authorities. It shall demonstrate ability to meet specified key dates through a logical work sequence that has taken account of the Project constraints.

1.1.6 Activities pertaining to review/acceptance by the Engineer and local authorities shall be identified. Where duration for review of the Contractor's submissions is specified elsewhere in the Contract, they shall be used. Where they are not specified, duration of 30 days for review of each submission shall be used.

1.1.7 Activities outside the scope of the Contract that may affect the Contractor's progress shall be shown.

1.1.8 The activity network shall be organised so that major work sections are carefully co-ordinated with the Civil Contractor and the System-wide Contractors to allow opportunity for all to work with as minimal disruption as possible. Critical paths shall be identified.

1.1.9 Activity descriptions shall be brief (<48 characters) and shall convey the nature and scope of the work. Uncommon abbreviations shall be explained in the legend. Float time shall be distinguished from schedule performance.

1.1.10 The CPM Network Diagram shall be developed to permit modification to the schedule and allow for impacts on the schedule to be analysed by introduction of "what if" statements into the input data.

1.2 Time Scaled Network/Bar Chart Details

1.2.1 Design: The Design network/bar chart shall detail the various design, submission and acceptance stages including approval by local authorities and the Engineer, preparation, submission and approval of drawings, manuals and all other activities related to the design.

1.2.2 Manufacturing: The manufacturing network chart shall indicate the relationship and duration of the activities necessary to procure, fabricate manufacture, assemble equipment/complete car tests, ship and deliver Rolling Stock in time to support the activities at site. It shall establish milestones for monitoring the progress of the manufacturing process. Major areas of work shall be shown as separate and distinct activities. The network shall also cover activities of Sub-Contractor as appropriate, including testing.

1.2.3 Testing, Commissioning and acceptance: The Factory and On Site Testing and Commissioning network/bar chart shall present the relationship and duration of those items relating to Commissioning tests including those related to other Designated Contractors. The network/bar chart shall present testing approach to be used, the deployment of resources in accordance with train delivery dates.

1.2.4 Instrumentation Tests for Pilot Metro Train: Instrumentation Tests network/bar chart shall indicate that activities related to Instrumentation Tests, including Oscillation Trials, followed by statutory approval, on the Pilot Metro Train including those related to Designated Contractors.

1.2.5 Integrated Testing: The Integrated Testing network/bar chart shall indicate the activities required to verify the functioning of the Rolling Stock in conjunction with activities of the System-wide and Civil Contractors.

1.2.6 Service Trials: After completion of Commissioning, the Contractor shall be required to carry out service trials. The network/chart shall indicate tests, measurements and interface tests required to be carried out to verify system performance and readiness for revenue service.

1.3 Work Program Software

1.3.1 The computerised Critical Path Method (CPM) using the Precedence Diagramming Method (PDM) shall be employed by the Tenderer in preparing their Part One submissions, and the Contractor in his Part Two submissions as well as all other programme submissions required during execution of the Contract.

1.3.2 Programming software shall be Primavera Project Planner for Windows Version 2.0b or latest, obtainable from Primavera Systems Inc.

1.3.3 Should the Tenderer wish to propose an alternative programming software, he shall demonstrate in his Tender submission the proposed software's capability for direct data exchange with Primavera Project Planner for Windows Version 2.0b or later. Such data exchange compatibility shall include, but not be limited to activity and resource coding. Full electronic data transfer to Primavera is required. The various levels of reporting and coding capabilities shall be at least equivalent to Primavera. Comparable performance between Primavera and the Contractor's proposed system shall be demonstrated. Scheduling Software and relevant instruction manuals, licensed for use in connection with the Contract, shall be provided by the Contractor.

1.3.4 Should the Engineer accept the Tenderer's proposed software, he shall upon award of the Contract supply the Authority with an original copy, including manuals and approved training, of the software and any subsequent versions thereof at no extra cost.

1.3.5 All terminology, definitions and conventions shall be in accordance with BS 4335 (Glossary of terms used in Project Network Techniques) or the Associated General Contractors (AGC) manual entitled "The use of CPM in Construction".

APPENDIX 2 MONTHLY PROGRESS REPORTS

2.1. Contract Stages

2.2. Financial Status

2.3. Physical Progress

2.4. Program Update (For Entire Project)

2.5. Milestones Status

2.6. Three Month Rolling Program

2.7. Planning and Co-Ordination

2.8. Procurement Report

2.9. Production and Testing

2.10. Safety

2.11. Environment

APPENDIX 2 - MONTHLY PROGRESS REPORTS

2.1 Contract Stages

2.1.1 The Contractor shall submit to the Engineer, a Monthly Progress Report. This Report shall be submitted by the end of each calendar month and shall account for all work actually performed from 26th day of the last month and up to and including the twenty-fifth (25th) day of the month of the submission. It shall be submitted in a format to which the Engineer shall have given his consent and shall contain sections/sub-sections for, but not be limited to, the topics listed in clauses 2 to 10 below.

2.2 Financial Status

2.2.1 A narrative review of all significant financial matters, and actions proposed or taken in respect to any outstanding matters.

2.2.2 A spreadsheet summarising each Cost Centre, the budget, costs incurred during the period, costs to date, costs to go, cost forecast (total of costs to date and costs to go) and cost variance (difference between cost forecast and budget).

2.2.3 A spreadsheet indicating the status of all payments due and made.

2.2.4 A report on of the status of any outstanding claims. The report shall in particular provide interim updated accounts of continuing claims.

2.3 Physical Progress

2.3.1 It shall describe the status of work performed, significant accomplishments, including critical items and problem areas, corrective actions taken or planned and other pertinent activities, and shall, in particular, address interface issues, problems and resolutions.

2.3.2 It shall include a simplified representation of progress measured in percentage terms compared with percentage planned as derived from the Works Program.

2.4 Program Update (For Entire Project)

2.4.1 Program updating shall include :

(i) The monthly Program Update which shall be prepared by recording actual activity completion dates and percentage of activities completed up to the twenty-fifth (25th) of the month together with estimates of remaining duration and expected activity completion based on current progress. The Program Update shall be accompanied by an Activity Report and a Narrative Statement. The Narrative Statement shall explain the basis of the Contractor's submittal:

- Early Work and Baseline Submittals – explains determination of activity duration and describes the Contractor's approach for meeting required Key Dates as specified in the Contract.
- Updated Detail Program Submittals – state in narrative the Works actually completed and reflected along Critical Path in terms of days ahead or behind allowable dates. Specific requirements of narrative are:
  - If the Updated Detailed Work Program indicates an actual or potential delay to Contract Completion date or Key Dates, identify causes of delays and provide explanation of Work affected and proposed corrective action to meet Key Dates or mitigate potential delays. Identify deviation from previous month's critical path.
  - Identify by activity number and description, activities in progress and activities scheduled to be completed.
  - Discuss Variation Order Work Items, if any.

(ii) the Program Status which shall :

- show Works Programme status up to and including the current report period, display Cumulative progress to date and a forecast of remaining work.
- be presented as a bar-chart size A3 or A4 and as a time-related logic network diagram on an A1 media, including activity listings;

(iii) the Activity Variance Analysis which shall analyse activities planned to start prior to or during the report period but not started at the end of the report period as well as activities started and/or completed in advance of the Works Program.

2.5 Milestones Status

2.5.1 A report on the status of all Milestones due to have been achieved during the month and forecasts of achievement of any missed Milestones, and those due in the next month.

2.6 Three Month Rolling Program

2.6.1 The monthly issue of the Three Month Rolling Program.

2.7 Planning and Co-Ordination

2.7.1 A summary of all planning/co-ordination activities during the month and details of outstanding actions.

2.7.2 A schedule of all submissions and consents/approvals obtained/outstanding.

2.8 Procurement Report

2.8.1 A summary of all significant procurement activities during the month, including action taken to overcome problems.

2.8.2 A report listing major items of plant and materials, which will be incorporated into the Works. The items shall be segregated by type as listed in the Specifications and the report should show as a minimum the following activities:

(i) purchase Order Date - Scheduled/Actual,

(ii) manufacturer/Supplier and Origin,

(iii) letter of Credit Issued date,

(iv) manufacturer/Supplier Ship Date - Scheduled/Actual,

(v) method of shipment,

(vi) arrival date in India- Scheduled/Actual.

2.9 Production And Testing

2.9.1 A review of all production and manufacturing activities during the month.

2.9.2 Summaries of all production and manufacturing outputs during the month together with forecasts for the next month.

2.9.3 Review of all testing activities (both at site or at the manufacture's premises) during the month

2.10 Safety

2.10.1 A review of all safety aspects during the month including reports on all accidents and actions proposed to prevent further occurrence.

2.11 Environment

2.11.1 A review of all the environmental issues during the past month to include all monitoring reports, mitigation measures undertaken, and activities to control environmental impacts.

APPENDIX 3 KEY DATES

The Key dates are as referred to in to the Form of Tender: Attachment to Appendix FT-1

APPENDIX 4 DRAUGHTING AND CAD STANDARDS

APPENDIX 4 - DRAUGHTING AND CAD STANDARDS

4.1 Introduction

4.1.1 The purpose of this document is to define the minimum Draughting and CAD standard to be achieved by the Contractor for all drawings produced by the Contractor for the purpose of the Works.

4.1.2 By defining a common format for the presentations of drawings and CAD files, the exchange of drawn information is improved and will maximise the use of CAD in the co-ordination process.

4.1.3 All submissions shall be made to the Employer's Requirement in a format reviewed without objection by the Employer's Requirement and in accordance with the requirements in:

(i) the Contract;

(ii) the Document Submittal Instructions to Consultants and Contractors.

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

4.1.5 The following software 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 office 2007 Professional version
Spread Sheets	MS office 2007 Professional version
Data Base Files	MS office 2007 Professional version
Presentation Files	MS office 2007 Professional version
Programs Ver 2.0a	Primavera for Windows, Ver. 2.0b, Suretrack
AutoCAD Graphics	AutoCAD 2008
Photographic	Adobe Photoshop, Ver.4.0
Desktop Publishing	Page Maker 6.5,5
CADD Drawings	AutoCAD 2008

4.1.6 Media for Electronic File Submission: One copy shall be submitted unless otherwise stated in CD-ROM.

4.1.7 Internet File Formats/Standards

(i) The following guidelines shall be followed when the Contractor uses the Internet browser as the communication media to share information with the Engineer

(ii) All the data formats or standards must be supported by Microsoft Internet Explorer version 3 or above running on Windows NT and Windows XP

(iii) The following lists the file types and the corresponding data formats to be used on the Internet. The Contractor shall comply with them unless prior consent is obtained from the Employer's Requirement for a different Data format :

File Type	Data Format
Photo Image	Joint Photographic Experts Group (JPEG)
Image other than Photo	GIF or JPEG

File Type	Data Format
Computer Aid Design files (CAD)	Computer Graphics Metafile (CGM)
Video	Window video (.avi)
Sound	Wave file (.wav)

4.1.8 The following states the standards to be used on Internet when connecting to database(s). The Contractor shall comply with them unless prior consent is obtained from the Employer's Requirement for a different standard :

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

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

4.2 General Requirements

4.2.1 The Contractor shall adopt a title block similar to that used in the Drawings for all drawings prepared under the Contract.

4.2.2 Each drawing shall be uniquely referenced by a drawing number and shall define both the current status and revision of the drawing.

4.2.3 The current status of each drawing shall be clearly defined by the use of a single letter code as follows:

- P - Preliminary Design Drawing
- D - Definitive Design Drawing
- C - Construction Reference Drawing
- W - Working Drawing
- B - As-Built Drawing
- M - As Manufactured Drawing
- E - Employer's Drawing

4.3 Drawing Numbering System

4.3.1 A suitable drawing numbering systems shall be evolved by the contractor and submitted to Engineer for his review. It shall present unique numbers and take care of revisions.

4.4 Types of Drawing

4.4.1 'Design drawings' mean all drawings except shop drawings and as-built drawings.

4.4.2 'Working drawings' are design drawings of sufficient detail to fully describe the Works and adequate to use for construction or installation.

4.4.3 Site drawings and sketches' are drawings, often in sketch form, prepared on site to describe modifications of the Working drawings where site conditions warrant changes that do not invalidate the design.

4.4.4 'Shop drawings' are special drawings prepared by the manufacturer or fabricator of various items within the Works to facilitate manufacture or fabrication.

4.4.5 'As-built drawings' show the Works exactly as constructed or installed. They are usually prepared by amending the working drawings to take into account changes necessitated by site conditions and described in Site drawings. These drawings shall be completed on a regular basis as the works progress, and shall not be left until completion of the entire works.

4.5 Computer Aided Design & Draughting (CAD) Standards

4.5.1 Scope of Use

Data input procedures between the Engineer and contractors must be co-ordinated, and the key parameters used to form CAD data files must be standardised. The production of all CAD data files shall comply with the 3.2 Objectives

4.5.2 The main objectives of the CAD standards are as follows:

(i) To ensure that the CAD data files produced for Project are co-ordinated and referenced in a consistent manner.

(ii) To provide the information and procedures necessary for a CAD user from one discipline or external organisation to access (and use as background reference), information from a CAD data file prepared by another discipline or external organisation.

(iii) To standardise the information contained within CAD data files, which may be common to more than one discipline such as drawing borders, title boxes, grid lines etc.

(iv) To establish procedures for the management of CAD data files.

(v) To ensure all contractors use 'Model space' and 'Paper space' in the production of their CAD files'.

4.6 General

4.6.1 To facilitate co-ordination between contractors, it is a requirement that all drawings issued by contractors for co-ordination or record purposes shall be produced using CAD methods. Drawings shall be issued in digital format in addition to the paper copies.

4.6.2 The intent of the issue of digital information is to aid the related design by others. The definitive version of all drawings shall always be the paper or polyester film copies, which have been issued by the contractor or organisation originating the drawing.

4.6.3 Drawings and drawing packages issued for co-ordination, record purposes or for acceptance shall be accompanied by a complete set of the corresponding CAD data files.

4.6.4 Any contractor or organisation making use of the CAD data from others shall be responsible for satisfying that such data is producing an accurate representation of the information on the corresponding paper drawing, which is satisfactory for the purpose for which he is using it. Provided the general principles of this section have been achieved by the originator of the CAD data, contractors making use of the CAD data from others shall not be entitled to require alterations in the manner in which such CAD data is being presented to them.

4.6.5 In particular, automatic determination of physical dimensions from the data file shall always be verified against the figured dimensions on the paper or polyester drawings. Figured dimensions shall always be taken as correct where discrepancies occur.

4.7 Terminology & Associated Standards / Guidelines

4.7.1 Any terminology used within this section that is ambiguous to the user shall be clarified with the Employer's Requirement. British Standard BS1192 is used in principle as a guide for drawing practice, convention, CAD data structure and translation.

4.8 Paper Drawings

4.8.1 For the Project "Paper" drawings are considered to be the main vehicle for the receipt and transmittal of design and production information, typically plans, elevations and sections.

4.8.2 The Project wide accepted media for the receipt and transmittal of "Paper" drawings will be paper and polyester film of various standard ISO 'A' sizes. The composition of this information shall be derived from a CAD "Model".

4.8.3 The CAD derived "Paper" drawing composition will reflect a window of information contained within a CAD "Model Space" file together with a selection of information contained within the associated CAD "Paper Space" file.

4.9 CAD Data Creation, Content & Presentation

4.9.1 A consistent method of CAD data creation, together with content and presentation is essential. The method of CAD "Model Space and Paper Space" creation is as follows:

(i) Model Space Files

- Typically CAD "Model Space" files are required for general arrangement and location plans and will consist of a series of other "Model Space" referenced CAD files covering the total design extents at a defined building level (the number of referenced files should be kept to an absolute minimum). Data contained within a CAD "Model Space" files is drawn at full size (1:1) and located at the correct global position and orientation on the Project Grid / or defined reference points.
- Each CAD "Model Space" file will relate to an individual discipline. Drawing border / text, match / section lines or detailed notation shall NOT be included within a CAD "Model Space" file. Dimensions shall be included within a CAD "Model Space" but located on a dedicated layer. Elevations, Long Sections and Cross Sections shall also be presented in CAD "Model Space" as defined above, but do not need to be positioned and orientated on the Project Grid.

(ii) Paper Space CAD Files

- Paper Space" CAD files are utilised to aid the process of plotting "Paper" drawings and are primarily a window of the CAD "Model Space" file. A "Paper Space" CAD file will typically contain drawing borders, text, match or section lines & detailed notation. Once these files are initially set up and positioned, the majority of "Paper Drawing" plots at various approved scales are efficiently and consistently generated by displaying different combinations of element layers and symbology contained within the "Paper Space" file and the referenced "Model Space" files.
- The purpose is to ensure that total co-ordination is achieved between the CAD "Model Space" file and the "Paper Drawing" output during the revision cycle of the design and production process. Duplicated data in "Model and Paper Space" files will not be acceptable unless an automatic update link exists between the two data sets. "Paper Space" files are not typically required as part of the CAD Media Receipt from contractors, unless specifically requested.

4.10 CAD Quality Control Checks

4.10.1 Random CAD Quality Control Audits will be carried out by Engineer on all CAD media received and transmitted.

4.10.2 These checks DO NOT verify the technical content of the CAD data received or transmitted (as this is the responsibility of the originating organisation), however compliance with Project CAD and Draughting Standards shall be checked.

4.10.3 In addition, all contractors who transmit and receive CAD data from the Project shall have CAD quality control procedures in place. A typical quality control procedure shall contain CAD data quality checking routines coupled with standards for CAD data transmittal and archiving.

4.11 CAD Data Transfer Media and Format

4.11.1 When CAD data is received & transmittal between Engineer and the Contractor, the media shall be as follows:

(i) Data Exchange Format - AutoCAD as stated above in clause 1.5.

(ii) Operating System - / Window NT 3.51 /Windows XP.

(iii) Data Transfer Media :

- 3.5" high-density diskettes in DOS format (Maximum 10 diskettes)
- 12cm Compact Disc (>650 MB) is highly preferred
- Portable SCSI hard disk (return to the Contractor upon data transfer) with software

(iv) All floppy diskettes or tapes must be labelled on the data shield with:

- Name of Company
- Project Title
- Drawing Filenames (for diskettes only)
- Diskette No. / Total No. of diskettes or Tape No. / Total No. of Tapes

(v) All media shall be submitted with a completed Form (CAD Disk/Tape Sheet).

(vi) The Contractor must ensure the supplied media is free from virus.

(vii) Sub-directories on tapes or disks are not permitted. If CAD Data is created using UNIX, archive commands must be unrooted.

4.12 CAD Media Receipt & Transmittal

4.12.1 CAD Media Transmittal (from the Contractor to Engineer) - this will consist of the following:

(i) CAD Digital Media [disk(s), CD's or tape (s)] shall typically contain CAD "Model Space" and "Paper Space" files.

(ii) CAD data sheet

(iii) CAD issue / revision sheet

(iv) CAD Quality Checklist confirming compliance.

(v) Plot of each "Model Space" file issued on an A1 drawing sheet (to best fit).

4.12.2 The above CAD media will be collectively known as "CAD Media Transmittal Set". The CAD data file transmittal format required by Engineer from all contractors shall be in AutoCAD.

4.12.3 All CAD media received from contractors will be retained by Engineer except for SCSI disk (if used) as an audit trail / archive of a specific contractor's design evolution.

4.12.4 CAD Media Receipt (from Engineer to the Contractor)

(i) CAD media should normally be obtained from the respective Designated contractor(s), but should Engineer issue CAD media it will consist of the following:

- CAD Digital Media (disk (s) or tape (s)) typically contain only CAD "Model Space" files.
- CAD data sheet.
- CAD issue / revision sheet

(ii) The above CAD media will be collectively known as the "CAD Media Receipt Set". The CAD data file transmittal format used by Engineer to all contractors will be in AutoCAD version as stated in clause 1.5.

(iii) Each CAD transmittal disk / tape will be labelled with proper disk label as approved by the Engineer. Any CAD data transmitted without this label is assumed to be provisional information not to have been quality checked and therefore not formally issued.

4.13 Revisions

4.13.1 All 'Revisions', 'In Abeyance' and 'Deletions' shall be located on a common layer. This layer can be turned on or off for plotting purposes.

4.13.2 The following example text indicates the current CAD file revision, i.e. 'Revision [A]'. This shall be allocated to a defined layer on all CAD "Model Space" files, in text of a size that will be readable when the CAD "Model Space" file is fitted to the screen, with all levels on.

4.14 Block Libraries, Blocks, & Block Names

4.14.1 All Construction Industry symbols produced as CAD Cells shall typically conform to British Standard BS1192 - part 3.

4.14.2 All Blocks created shall be Primitive (i.e. NOT Complex) and shall be placed Absolute (i.e. NOT Relative).

4.14.3 The Contractor's specific block libraries shall be transmitted to Engineer together with an associated block library list containing the filename (max. 6 characters) and block description. The Contractor shall ensure that the library is regularly updated and circulated to all other users, together with the associated library listing.

4.14.4 All Blocks of a common type, symbols or details should initially be created within a CAD "Model Space File" specifically utilised for that purpose. These files will be made available on request by Engineer.

4.14.5 All Blocks created will typically be 2D unless 3D is specifically requested. In both instances they shall have an origin at a logical point located within the extents of each Block's masked area or volume.

4.15 CAD Dimensioning

4.15.1 Automatic CAD Dimensioning will be used at all times. Any dimensional change must involve the necessary revision to the model space file. If the CAD Quality Control Checks find that the revisions have not been correctly carried out, the rejection of the entire CAD submission will result.

4.16 CAD Layering

4.16.1 All CAD elements shall be placed on the layers allocated for each different discipline. The layer naming convention to be adopted by the Contractor shall be submitted for acceptance and inclusion within these standards.

4.17 Global origin, Location & Orientation on the Alignment Drawing.

4.17.1 Location or Plan information in "Model Space" files shall coincide with the correct location and orientation on the Project grid for each specific contract.

4.17.2 Location plans shall have at least three setting out points shown on each CAD "Model Space" file. Each setting out point shall be indicated by a simple cross hair together with related Easting and Northings co-ordinates. The Civil Contractor(s) will establish the three setting out co-ordinates for their respective works, which will then be used by all other contractors including the Contractor.

4.18 Line Thickness and Colour

4.18.1 To assist plotting by other users, the following colour codes will be assigned to the following line thickness / pen sizes.

Colour	Code No.	Line Thickness
Red	10	0.18
White	7	0.25
Yellow	2	0.35
Brown	34	0.5
Blue	130	0.7
Orange	30	1.0
Green	3	1.4
Grey	253	2.0

4.19 CAD Utilisation of 2D & 3D Files

4.19.1 Although the project standard is 2D CAD files, certain disciplines and contractors may use 3D CAD files for specific applications or where the isolated use of 3D aids the design and visualisation process (i.e. Architecture, Survey and Utilities). In these specific instances 3D CAD data will only be transmitted if all other users can use this data. If this is not the case, 3D to 2D translation shall be processed by the creator prior to issue.

4.20 CAD File Numbering

4.20.1 Contractors CAD File Numbering shall be described in 4.2 above.

4.20.2 Employer CAD File Numbering: Unlike most of the contractors, Employer will not be required to produce numerous CAD files. This will follow the numbering system Except that the status of the drawing shall be "E".

4.21 CAD File Naming Convention - General

4.21.1 CAD "Model Space" files shall be named in accordance with general drawing conventions.

APPENDIX 5 DESIGN AND CNTRACTOR'S CERTIFICATE

5.1 Design Certificate: Pro-Forma

5.2 Contractor's Statement: Pro-Forma

5.3 Contractor's Certification: Pro-Forma

5.1 Design Certificate: Pro-Forma

This Design Certificate refers to Submission No..…… which comprises:

[description of the Works to which the submission refers]

The contents of this submission are scheduled in Section A below.

Section A : Submission No. ..…... comprises the following :

Drawings : (Title, drawing number and revision)

Other : (Title, reference number and revision)

(i) . . . . . .

(ii). . . . . .

(iii) . . . . . .

(iv) . . . . . .

etc.

The documents scheduled in Section B below, for which a Notice of No Objection has been issued, are of relevance to this submission.

Section B: Documents for which a Notice of No Objection has been issued and which are of relevance to this Submission No. .....

Item Reference: (Title, reference number and revision)

(i) . . . . . .

(ii). . . . . .

(iii) . . . . . .

(iv) . . . . . .

etc.

5.2 Contractor's Statement: Pro-Forma

We certify that:

(a) the design of the Works, as illustrated and described in the documents scheduled in Section A above, complies with the Employer's Requirements General /Technical Specification

Clause……..

Covering……
……
……

(b) an in-house check has been undertaken and completed to confirm the completeness, adequacy and validity of the design of the Permanent Works as illustrated and described in the documents scheduled in Section A below;

(c) all necessary and required approvals relating to the design of the Works, as illustrated and described in the documents scheduled in Section A, above have been obtained and copies of such approvals are annexed in Section C below;

(d) all effects of the design comprising the submission on the design of adjacent or other parts of the Works have been fully taken into account in the design of those parts.

Name…….

Position/ Designation…….

Date……..

Signed by Contractor's Authorised Representative

5.3 Contractor's Certification: Pro-Forma

This Certifies that all design has been performed utilizing the skill and care to be expected of a professionally qualified and competent designer, experienced in work of similar nature and scope. This further certifies that all works relating to the preparation, review, checking and certification of design has been verified by us.

Name

(for Contractor)

Position/Designation

Signed by 'Authorized Representative' Date

Note 1

The Contractor shall insert one of the following, as applicable:

(i) the Contractor's Technical Proposals

(ii) the Contractor's Technical Proposals and Design Packages Nos. ..... for which a Notice of No Objection has been issued.

(iii) Design Packages Nos. ..... for which a Notice of No Objection has been issued if such Design Packages develop and amplify the Contractor's Technical Proposals.

(iv) The Definitive Design

Section C

[Contractor to attach copies of necessary and required approvals]

(i) . . . . . .

(ii). . . . . .

(iii) . . . . . .

(iv) . . . . . .

etc.

APPENDIX 6 SPARES

6.1. Unit Exchange Spares

6.2. Mandatory Spares:

6.3. Recommended Spares

6.4 Consumable Spares

6.5 Special Tools, Jigs, Fixtures, Gauges, Testing and Diagnostic Equipment

6.6 Overhauling Spares

6.7 DLP Spares

APPENDIX 6 - SPARES

6.1 Unit Exchange Spares

6.1.1 For details, refer to 'Appendix-GA1' in 'Pricing Document'. Prices of spares shall be actual prices and not apportioned prices. The spares shall be delivered at the Central Park Depot. The delivery is linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.1.2 Contractor to revise and resubmit Final List with Final Design Submission

6.2 Mandatory Spares:

6.2.1 For details, refer to 'Appendix-GA2' in 'Pricing Document'. Prices of spares shall be actual prices and not apportioned prices. The spares shall be delivered at the Central Park Depot. The delivery is linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.2.2 Contractor to revise and resubmit Final List with Final Design Submission

6.3 Recommended Spares

6.3.1 Tenderers shall submit list of recommended spares and quote for the same as per 'Appendix-GA3' in 'Pricing Document'. Prices of spares shall be actual prices and not apportioned prices. The spares shall be delivered at the Central Park Depot. The delivery is linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.3.2 Contractor to revise and resubmit Final List with Final Design Submission

6.4 Consumable Spares

6.4.1 Tenderers shall submit list of consumable spares for Fourteen (14) train sets of six cars and quote for the same as per 'Appendix-GA4' in 'Pricing document'. Prices of spares shall be actual prices and not apportioned prices. The spares shall be delivered at the Central Park Depot. The delivery is linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.4.2 Contractor to revise and resubmit Final List with Final Design Submission

6.5 Special Tools, Jigs, Fixtures, Gauges, Testing and Diagnostic Equipment

6.5.1 Tenderers shall submit list of recommended Special Tools, Jigs, Fixtures, Gauges, Testing and Diagnostic Equipment and quote for the same as per 'Appendix-GA5' in 'Pricing document'. Prices shall be actual prices. The Special Tools, Jigs, Fixtures, Gauges, Testing and Diagnostic Equipment shall be delivered at the Central Park Depot. The delivery is linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.5.2 Contractor to revise and resubmit Final List with Final Design Submission

6.6 Overhauling Spares

6.6.1 Tenderers shall submit list of overhauling spares for five (5) train sets of six cars and quote for is the same as per 'Appendix-GA6' in 'Pricing document'. Prices of spares shall be actual prices and not apportioned prices. The spares shall be delivered at the Central Park Depot. The delivery linked to the key dates indicated in the notes under Cost Centre 'G' of 'Pricing Document'.

6.6.2 Contractor to revise and resubmit Final List with Final Design Submission.

6.7 DLP Spares

6.7.1 The Tender is to supply the minimum List of Spares that will be stocked by the Contractor during DLP in 'Appendix G (DLP) in the Pricing Document.

APPENDIX 7 ABBREVIATIONS

APPENDIX 7 - ABBREVIATIONS

Abbreviation	Description
A0, A6	International Document Paper Sizes
a.c.	Alternating Current
AGC	Associated General Contractors
ATO	Automatic Train Operation
ATP	Automatic Train Protection
BS	British Standard (s) (Institution)
CAD	Computer Aided Design and Draughting
CPM	Critical Path Method
CR	Contractor Representative
DC	Direct Current
DCA	Design Certificate Application
DCC	Design Certificate (of) Consent (Sheet)
DLP	Defect Liability Period
DRCA	Design Review Certificate Application
EMC	Electro-Magnetic Compatibility
EN	European Standards (Organization)
GCC	General Condition of Contract
ISO	International Standards Organization (Standard)
JIS	Japanese International Standards
LOA	Letter of Acceptance
MRTS	Metro Rail Transport System
NTP	Notice To Proceed
OEM	Original Equipment Manufacturer
OSR (S)	Operational Safety Report (Software)
PDM	Precedence Diagramming Method
RAM	Reliability availability and maintainability
RDSO	Research, Design and Standard Organization
RS	Rolling Stock (metro train Cars)
SECP	Software Engineering Change Proposal
SCC	Special Condition of Contract
SI	International System (of Metrication)
SI	Static Inverter

APPENDIX 8 SITE FACILITY

8.1 Proposals for Use of Site and Site Management

8.2 Drawing List

8.1 Proposals for Use of Site and Site Management

The Contractor will be given access to the site in accordance with Sub-Clause 2.2 of GCC.

The Contractor will be provided with limited space for setting up temporary office and stores before the arrival of first pilot train for the purpose of testing and commissioning of train in Depot area. The Tenderer is to note that the Contractor will be fully responsible for the provision of all utility services necessary for the construction and completion of the Works, except for electricity and water as it is specified in Sub-Clause 4.1 and 4.18 of General Conditions of Contract. The Tenderer shall indicate his proposals for the provision of utility services to the Site.

The Contractor shall, however, provide his own lifting facilities at the port, transhipment points and depot for loading and unloading rolling stock and heavy equipments. However, the contractor will be allowed, free of charge, traction power and test track, for assembly, testing, trials, commissioning and repairs (if any) to rolling stock. The Contractor shall also be allowed the use of Depot facilities subject to availability as shown in Drawings as Listed.

The Site will not be available to the Contractor until the delivery of the 1st/Pilot Metro Train to KMRCL CPD Site, unless otherwise permitted by the Engineer.

The Contractor may set up his design office / co-ordination office at a suitable location at his own cost.

8.2 Drawings List

- Drawings are provided for in Volume 5 – Tender Drawings

Sl. No.	Architecture	Drawing No.	Revision
1	Site Plan	282954-CPD-D-AR-SPN-2101	D1
2	Workshop Floor Plan	282954-CPD-C-AR-WKS-2214	C0
3	Stabling Yard Floor Plan (Part 1)	282954/CPD/C/ST/STB/6317	C0
4	Stabling Yard Floor Plan (Part 2)		
5	ETU Floor Plan	282954-CPD-C-AR-ETU-2412	C0

APPENDIX 9 SUBMITTALS

9.1 Tenderer Submissions

9.2 Contractor Submissions

9.1 Tenderer's Submissions (General Specification)

S.N.	Outline Plan	Ref
1	Outline Project Management Plan	GS 2.2
2	Sub-Contractor/Vendor List	GS 2.2.2
3	Outline Interface Management Plan	GS 2.3
4	Outline Work Management Plan	GS 2.4
5	Outline Quality Assurance Management Plan	GS 2.5
6	Outline System Safety Assurance Management Plan	GS 2.6
7	Outline Reliability,Availability and Maintainability Assurance Management Plan	GS 2.7
8	Outline Site Safety Management Plan	GS 2.8
9	Outline Software Quality Assurance Management Plan	GS 2.9
10	Outline Environmental Management Plan	GS 2.10
11	Outline Inspection, Testing, Commissioning and Integration Management Plan	GS 2.11
12	Training Proposal	GS 10.1.1
13	Proposal for Use of Site and Site Management	GS 11.5

Note: GS is abbreviation for General Specification

9.2 Contractor Submission (Proposed)

S.N.	Plan	Key Dates (Weeks from LOA)	Ref
1	Project Management Plan	4	GS 2.2
2	Sub-Contractor/Vendor List	4	GS 2.2.2
3	Interface Management Plan	4	GS 2.3
4	Work Management Plan	4	GS 2.4
5	Quality Assurance Management Plan	8	GS 2.5
6	System Safety Assurance Management Plan	8	GS 2.6
7	Reliability,Availability and Maintainability Assurance Management Plan	12	GS 2.7
8	Site Safety Management Plan	12	GS 2.8
9	Software Quality Assurance Management Plan	8	GS 2.9
10	Environmental Management Plan	8	GS 2.10
11	Testing and Commissioning Management Plan	16	GS 2.11
12	Design Submission Requirement	4	GS 3
13	Training Plan	16	GS 10.1.1
14	Proposal for Use of Site and Site Management	16	GS 11.5
15	Design Certificate	70	GS 5.1
16	Contractor's Statement	70	GS 5.2
17	Contractor's Certification	70	GS 5.3
18	Final Unit Exchange Spares List	90	GS 6.1
19	Final Mandatory Spares List	90	GS 6.2
20	Final Recommended Spares List	90	GS 6.3
21	Final Overhauling Spares List	90	GS 6.4
22	Final Consumable Spares List	90	GS 6.5
23	Final Special Tools, Jigs, Fixtures, Gauges, Testing and Diagnostic Equipment Lists	90	GS 6.6