SECTION-8A

EMPLOYER'S REQUIREMENTS

GENERAL INFORMATION
AND
SCOPE OF WORK
PART-1

INDEX

SECTION – 8A Part-1 - Employer's Requirements

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1 Contractor's Organisation and Superintendence

1.1 General

1.1.1 The Contractor shall staff the Project with manpower sufficient to achieve the Time for Completion date stated in the Key Dates.

1.1.2 Throughout the design and execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

1.1.3 Superintendence shall be given by a sufficient number of persons having adequate knowledge of Hindi/Kannada and the English language, and any other language as may be appropriate, of the operations to be carried out (including the methods and techniques required and the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

1.1.4 The Contractor's Personnel shall be appropriately qualified, skilled and experienced in their respective trades or occupations.

1.2 Organisation chart

1.2.1 Within 30 days of the Commencement Date the Contractor shall submit to the Engineer for review and approval a mobilisation plan and organisation chart detailing the proposed management, design and technical staff organisation for the Contract.

1.2.2 This organisation chart shall cover all aspects of the Contract and define the functions, responsibilities and authorities of each person represented.

1.2.3 Lines of reporting and responsibility of subordinates shall be included in the chart.

1.3 Key Personnel

1.3.1 Key Personnel shall be directly employed by the Contractor.

1.3.2 After the Commencement Date the Contractor shall submit names, qualifications and experience of all Key Personnel, as detailed in clause 1.3.6, for approval by the Engineer.

1.3.3 The Contractor shall ensure that all the Contractor's personnel of are approved by the Engineer. Deployment is to be done as per the approved mobilization plan.

1.3.4 The Contractor shall not remove or replace any Key Personnel without the prior approval of the Engineer. Any substitute Key Personnel shall be suitably qualified and experienced for the duties of the position to which the Contractor intends to appoint them. Any changes or additions to either the organisation or Key Personnel shall be submitted for approval to the Engineer.

1.3.5 The Contractor shall ensure that there is a minimum handover period of two weeks for new Key Personnel.

1.3.6 Key Personnel shall have the minimum qualifications and experience as described in the table below;

Category (1)	Specialisation Position (2)	Minimum Numbers (3)	Qualification (4)	Minimum Experience post qualification in metro& Railway rail project with specified Field (refer Column 2) (Years) (5)	Minimum total experience post qualification (Years) (6)
C1.1 *	Contractor's Representative, official representative of the Contractor to the Employer with experience in Metro & Railway construction, major infrastructure design and build projects including design management, project management and construction supervision	1	B.E. (Civil)	5	≥20
C1.2 *	Project Controls Manager, with experience in major infrastructure design-build projects, including design management, project management, and construction management and reporting.	1	B.E. (Civil)	5	≥15
C1.3 *	Engineering Manager, with experience in major multi-disciplinary infrastructure design and build projects, including Metro & Railway elevated guideway and buildings.	1	B.E. (Civil)	5	≥20
C1.4 **	Structural Engineer, experienced in civils, Metro & Railway stations and structures on large infrastructure rail/Metro projects.	1	B.E (Civil)	5	≥15
C1.5	Deleted				
C1.6 **	Design Architect, experienced in the design of Metro &Railway elevated or Underground stations	1	B. Arch.	5	≥15
C1.7 **	QA Manager, experienced in management of Quality Assurance systems on large transport infrastructure projects.	2	B.E. (Civil)	4	≥15

Category (1)	Specialisation Position (2)	Minimum Numbers (3)	Qualification (4)	Minimum Experience post qualification in metro& Railway rail project with specified Field (refer Column 2) (Years) (5)	Minimum total experience post qualification (Years) (6)
C1.8**	QC Manager, experienced in management of Quality Control systems on large transport infrastructure projects.	3	B.E. (Civil)	4	≥10
C1.9**	Health and Safety Manager, experienced in management of Health & Safety Assurance systems on large transport infrastructure projects, including OHSAS 18001 compliance	2	B.E. (Civil)	5	≥15
C1.10**	Environmental Manager, experienced in management of Environmental Assurance systems on large transport infrastructure projects including ISO 14001 compliance	1	B.E. (Env.)	4	≥12
C1.11**	Civil Construction Manager, experienced in major infrastructure design and build and experience in Metro & Railway stations Guideway and Station construction	4	B.E. (Civil)	5	≥15
C1.12**	Senior Geotechnical Engineer, with experience in geotechnical site investigation and reporting	1	M. Tech (Geotech) or M.Sc. (Geology)	5	≥10
C1.13	Deleted				
C1.14	Deleted				
C1.15	Architectural Construction Manager/Expert, experienced in major infrastructure design and build and experience of fit-out of Metro & Railway Stations	4	B. Arch.	5	≥15
C1.16*	Stakeholder Manager/utility Manager, will be the	1	B.E. (Civil)	3	≥10

Category (1)	Specialisation Position (2)	Minimum Numbers (3)	Qualification (4)	Minimum Experience post qualification in metro& Railway rail project with specified Field (refer Column 2) (Years) (5)	Minimum total experience post qualification (Years) (6)
	primary contact with all external parties and will meet, discuss and understand their needs and issues and manage their expectations				
C1.17*	Commercial Manager, will provide oversight on all commercial matters relating to the design, construction and supply contracts, managing the procurement and budget control functions.	1	Graduate in Civil Engineering and Cost Accountant	5	≥15
C1.18	Risk Manager, will be experienced in identifying risks to the project and to the program as a whole through a systematic approach and developing risk mitigation strategies.	1	Graduate in Engineering	5	≥15
C1.19	Sustainability Manager, will provide implementation oversight and assurance and performance reporting on all sustainability matters including sustainability certification.	1	Graduate in Engineering	3	≥10
C1.20	BIM Manager, will provide oversight on all building information management and Clash detection	1	Diploma/Graduate in Engineering/Architecture	3	≥10
C1.21**	Interface Manager will manage and document design interface between all disciplines and stakeholders	2	B.E. (Electrical or Mechanical or Civil or Electronics)	5	≥15
C1.22	Deleted				
C1.23	Public Relation Officer, responsible to manage/handle press, PR activities, band visibility	1	PG in Mass Communication/ Journalism	-	≥7

Note:
* - To be available from the Commencement date.
** - To be available within 45 Days from the Commencement Date (wherever 2 positions are required at least 1 should be deployed)

Other Key Personnel to be deployed as per the approved mobilization plan.
In case of any delay in mobilisation or non-availability for longer period, Delay Damages of INR 2,00,000 (Two Lakh) per month for each Key Personnel shall be levied.

1.3.7 The Engineer may designate other positions as Key Personnel or reduce the number of such positions at any time during the Contract.

1.3.8 The mobilisation plan shall show the qualifications and experience of all staff and shall show the Contractor's management structure and state clearly the duties, responsibilities and authority of each member of staff.

1.3.9 The mobilisation plan shall be updated and resubmitted to the Engineer for review whenever there are changes to the Contractor's staff.

1.3.10 The Contractor's Representative and personnel shall have experience appropriate to the type and magnitude of the work under the Contract and shall possess relevant university degrees or equivalent qualifications appropriate to their individual duties.

1.3.11 The Contractor shall employ engineers, foreman and supervisors in connection with each trade who are suitably experienced in that trade. The engineers, foreman and supervisors shall be present at all times when that trade is being undertaken and shall directly supervise the personnel carrying out the tasks

The Contractor shall submit details of the qualifications and experience of any specialist staff identified in addition to those listed above that it proposes to use in the major disciplines required to construct the work under the Contract.

1.3.12 Minimum level of Shift In-charge should be Senior Engineer (having B.E/B. Tech in Civil Engineering) with 5 years of relevant field experience in Metro& Railway activities. In this connection, Diploma with 5 years' experience in relevant field will be considered equivalent to degree.

1.3.13 "Minimum total experience post qualification (years)" means total experience of work in any Infrastructure construction related to predominantly Civil engineering projects including all other elements of MEP etc.

1.3.14 "Minimum Experience in the specified field" means the experience of work mentioned in the Column (2) of table 1.3.6.

1.4 Design Team Key Persons

1.4.1 The Contractor's key functional Designer team discipline leads for Civil, Structural, MEP and Architectural shall be located and based full-time on site in Bangalore, hence ensuring the timely daily management of the design activity.

1.4.2 The Contractor shall submit details of proposed key Designer team members to the Engineer for approval.

The minimum requirements for the Designer and lead team members shall be. Category (1)	Specialisation Position (2)	Minimum Numbers (3)	Qualification (4)	Minimum Experience post qualification in metro & Railway rail project with specified field (refer Column 2) (Years) (5)	Minimum Total Experience post qualification (Years) (6)
D1.1	Design Project Manager, with experience in major multi-disciplinary infrastructure design build projects, elevated structures, buildings, Metro & Railway Station MEP and Architecture	1	M. Tech (Structures)	5	≥20 Years
D1.2	Lead Design Structural Engineer, experienced in the design of Metro& Railway Station structures	2	M. Tech (Structures)	5	≥15 Years
D1.3	Lead Design Electrical Engineer, with experience in the design of Metro & Railway Station Electrical Systems, Fire Life Safety installations, and ventilation and air-conditioning systems	2	B.E (Electrical)	5	≥10 Years
D1.4	Lead Design Mechanical Engineer, with experience in the design of Metro & Railway Station Mechanical Systems, Fire Life Safety installations, and ventilation and air-conditioning systems including Plumbing works	2	B.E (Mechanical)	5	≥10 Years
D1.5	Lead Design Architect, experienced in the architectural design of Metro &Railway elevated Stations	2	B. Arch.	5	≥15 Years
D 1.6	BIM Manager, will provide oversight on all building information management and Clash detection	1	Diploma / Graduate in Engineering / Architecture	3	≥10
D 1.7	Senior Geotechnical Engineer, with experience in Geotechnical designs, site investigation and reporting	1	M. Tech (Geotech)	5	≥10

Key Personnel to be deployed as per the approved mobilization plan.

In case of any delay in mobilisation or non-availability for longer period, Delay Damages of INR2,00,000 (Two Lakh) per month for each Key Personnel shall be levied.

1.5 Subcontractors and Suppliers

1.5.1 For all Subcontractors and Suppliers, the Engineer's approval shall be obtained prior to mobilisation unless otherwise instructed by the Engineer with respect to Section 5 & Section 7 (CC & PCC).

1.5.2 The Engineer's prior written approval of any subcontractor, supplier or any lower tier subcontractor or supplier shall be obtained on a case by case basis and as required by the Engineer.
In the first instance the Contractor shall submit the following information to the Engineer for review;

a. Name of Subcontractor or Supplier;
b. Registered, Corporate and Site office details as applicable;
c. Scope of work or supply;
d. Approximate value of the subcontract or material/equipment purchase;
e. Relationships in the supply chain if not direct, i.e. purchase through a 3rd party;
f. Relevant work experience details of subcontractor including documentary proof;
g. Proof material/equipment from a supplier has been used on a Metro rail / railways project in India.

1.5.3 The Contractor shall provide full details of all Subcontractors, vendors and sub-vendors, including as a minimum those chosen for:

a. Utility diversions
b. Piling and Foundations
c. Civil works
d. Pre-Engineered Building works
e. Architecture works
f. Mechanical, Electrical &Plumbing
    i. Electrical works including Lighting, HVAC, Diesel Generators, and Pumps etc.
    ii. UPS and Batteries
    iii. Switch Gear and Distribution Panels
    iv. Fire Life Safety Systems
    v. Building Automation Control Systems
    vi. Public Health Engineering (PHE) works

1.6 Health and Safety Staff

1.6.1 Within 30 days of the Commencement Date, the Contractor shall as a minimum appoint at least the following number of full-time health and safety staff and at all times comply fully with Indian Law. The Contractor shall confirm monthly the strength of their Health and Safety team on the Contract.

1.6.2 As a minimum the Contractor shall comply with the following;

a. The Contractor shall appoint one (1) full-time Health and Safety Manager {Key Personnel} who shall be submitted to the Engineer for review. The health and safety manager shall meet the minimum requirements in accordance with current Indian Law and standards.
b. The Contractor shall appoint one (1) full-time Deputy Health and Safety Manager who is capable of performing all of the duties of the health and safety manager during their absence. The Deputy Health and Safety must meet the requirements in 1.6.1.a.
c. The Contractor shall appoint competent health and safety officers and support staff in sufficient numbers to ensure the effective function of the health and safety discipline within the Contractor's organisation. The Contractor shall appoint and deploy full time on the Site.
    i) One (1) health and safety officer for each and every 50 persons employed at the Site.
    ii) For less than 50 persons employed at the Site, a minimum of one (1) health and safety

officer shall be present on Site during all working hours each day throughout the Contract period.

iii) This requirement is in addition to the health and safety manager and the deputy health and safety manager.

d. The Contractor shall ensure that each Subcontractor employed on the Site appoints suitably qualified health and safety staff to ensure the effective function of the health and safety discipline within the Subcontractor's organisation;

i) The Subcontractor shall appoint and deploy full time on the Site one (1) health and safety officer for each and every 50 persons that they employ at the Site.

ii) Any Subcontractor that employs more than 100 persons shall appoint a health and safety manager in addition to their health and safety officers.

iii) The Subcontractors Health and Safety team shall comply fully with the Contractors Health and Safety systems and shall directly report to the Contractors Health and Safety Manager.

e. Health and safety officers shall have no other duties, either on-Site or off-Site, other than health and safety duties, and shall be exclusive to one Site.

1.7 Records of Contractor's Personnel

1.7.1 The Contractor shall submit monthly to the Engineer details showing the number of each class of Contractor's Personnel, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

1.7.2 The Contractor shall submit monthly to the Engineer a certified payroll for their direct employees and for their subcontractors.

1.8 Responsibility Matrix

1.8.1 The Contractor shall submit within 60 days of the Commencement Date a Management and Supervision Responsibility Matrix (RACI) confirming roles and responsibilities in a format to be agreed with the Engineer.

1.9 Festivals and Religious Customs

1.9.1 The Contractor shall in all dealings with his staff and labour have due regard to all recognised festivals, days of rest and religious or other local customs.

1.10 Burial/Cremation of the Dead

1.10.1 The Contractor shall make all necessary arrangements for the transportation to any place as required for the burial and death rituals or cremation of a body, of any of his employees who dies whilst working on the Contract.

1.11 Disorderly Conduct

1.11.1 The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

1.12 Housing of Labour

1.12.1 The Contractor, shall, at his own expense, make adequate arrangement for the housing, supply of drinking water and provision of bathrooms, latrines and urinals, with adequate water supply, for his staff and workmen directly or through Sub-Contractor's employed on the works at the location authorised by

the Employer.

1.12.2 No labour camp shall be allowed at any work site provided by the Employer or any unauthorised place.

1.12.3 The Contractor at his own cost shall maintain all sites and welfare facilities in a clean and sanitary condition. The Contractor shall obey all health and sanitary rules and regulation, and carry out at his cost all health and sanitary measures that may from time to time be prescribed by the Local/Medical Authorities and permit inspection of all health and sanitary arrangements at all times by the Employer, Engineer and the staff of the local municipality or other Authorities concerned. Should the Contractor fail to provide adequate health and sanitary arrangements, these may be provided by the Employer and the cost recovered from the Contractor.

1.12.4 The Contractor shall at his own cost, provide First Aid and Medical facilities at the Labour Camp and at work sites on the advice of the Medical Authority in relation to the experience, and number of the Contractor's staff and workmen, employed directly.

1.12.5 The Contractor shall at his own cost, provide the following minimum requirement for fire precautions:

- Portable Fire Extinguishers.
- Manual Fire Alarms
- Water Supply for use by the Fire Service.

The Contractor at his own cost shall provide necessary arrangements for keeping the camp area sufficiently illuminated to avoid accidents to the Workers. He should also ensure that electrical installations are carried out by Trained Electricians. These installations shall be maintained, and daily maintenance records must be made available for inspection of the Engineer.

1.12.6 On completion of the Contract, unless otherwise agreed with the Employer, the temporary camps, housing provided by the Contractor shall be removed and the site accommodation reinstated to its original condition, all to the approval of the Engineer.

2 Commercial, Cost, Risk & Change Management

2.1 General

2.1.1 The Contractor's organisation shall include commercial resources to undertake the Contractor's commercial and contractual administration for the work under the Contract. The Contractor's commercial duties and obligations shall include, but are not limited to the following items.

2.2 Change Management

2.2.1 Change Management Plan

a. Within 45 days of the Commencement Date the Contractor shall issue to the Engineer for review, a Change Management Plan {CMP} and documented processes for change management demonstrating compliance with the change management requirements of the Contract.

b. Within 60 days of the Commencement Date the Contractor shall implement a comprehensive and robust system and processes for change management.

2.2.2 Variation Proposals

All variations will be dealt in accordance with Clause 13 GCC & PCC.

2.2.3 Variation Reporting

a. The Contractor shall submit a Monthly Variation Report in a form approved by the Engineer.

b. The Variation Report shall:

i. Detail all Variations instructed to date with appropriate referencing and descriptions,

ii. Record actual and anticipated costs incurred and an estimate of the amount of such work completed, expressed as a percentage; and

iii. Contain details of cost proposals in preparation and those which have been submitted to the Engineer for consideration in advance of a variation being instructed.

2.3 Commercial Management

2.3.1 Cash Flow Reporting

a. The Contractor shall submit a projected monthly cash flow analysis for the work under the Contract to the Engineer, within 30 days of the Commencement Date.

b. Accompanying the Baseline Programme the Contractor shall submit for the approval of the Engineer, a cash flow analysis to support the Programme.

c. The cash flow analysis shall detail the anticipated amounts to which the Contractor considers he will be entitled to have certified monthly as the work under the Contract is progressed. It shall be aligned with the Programme, work and cost breakdown structures. It shall be for the Engineer's information only and shall not form the basis for certification assessment.

d. An updated cash flow report shall be included in the Monthly Progress report. This report shall align with and be adjusted according to the actual progress of the work under the Contract, the proposals to undertake remaining work under the Contract, and any Variations instructed by the Engineer.

2.3.2 All invoices shall be submitted with substantiation and certification to permit the Engineer to process payment. Certification of work shall include the Quality Manager's written confirmation, as required by Self-Certification, that the work in question is in full compliance with the Employer's requirements and the Contractors design.

2.4 Risk Management

2.4.1 The Contractor shall ensure that:

a. A risk management system is established, compliant with ISO 31000, implemented and maintained;

b. The performance of the risk management system is to be reported to the Contractor's management for review and as a basis for improvement identified;

c. The performance of the risk management system is reported to the Engineer for review, and

d. A risk management plan {RMP} shall be submitted to the Engineer for approval within 60 days of the Commencement Date.

2.5 Commercial, Contractual and Cost Management Reporting

2.5.1 The Contractor shall submit a monthly Contract Price assessment in a format approved by the Engineer. The assessments shall show the Contract Price adjusted to incorporate the effects of instructed variations and cost proposals in preparation or submitted to the Engineer in respect of potential Variations.

2.5.2 The Contractor shall indemnify the Employer, the Employer's Personnel, and their respective consultants in accordance with Section 5 & 7 (CC & PCC).

2.5.3 The Contractor shall report cost in WBS and CBS format as mandated by the Engineer.

2.5.4 Monthly Reports shall include, but not be limited to, the following features:

a. change control;

b. project controls;

c. cost management.

2.5.5 All reporting shall be in a format compatible with the Employer's Project Management Information System PMIS.

3 Planning, Programming and Progress Management

3.1 Project Management

3.1.1 The Contractor shall provide effective project management of all Contract activities for the work under

the Contract. It is a prime responsibility of the Contractor to manage the work under the Contract to achieve the requirements of the Contract, meeting all the timelines without delays.

3.1.2 The Contractor shall fully cooperate with the Engineer in coordination with all parties involved with the project, not only limited to the designer(s) of interfacing works, other Project Partners (Contractors and Designers), private developers and concerned local statutory authorities.

3.2 Software

3.2.1 The Contractor shall implement and use a computerised system to plan, execute, maintain and manage the planning, design, pre-construction, construction, testing and commissioning of the work under the Contract throughout the Contract period.

3.2.2 The Contractor shall use Primavera Project P6, the version is to be confirmed and approved by the Engineer, software for Programme management or as directed otherwise by the Engineer.

3.2.3 The Contractor shall provide and supply 2 (two) licences each of the Program management software (P6) to the Engineer with relevant installation and operation manuals free of cost for use in connection with and for the duration of the Contract.

3.2.4 The Contractor shall comply with all the protocols related to the access to and the security of the Employer and Engineer's computer networks and intranet. The Contractor shall provide all tools, equipment, manuals and training as necessary for the Employer and Engineer to use, maintain and re-configure all of the software provided under the Contract. All software used by the Contractor shall be original and licensed by the supplier.

3.3 Programmes

3.3.1 The Key Dates are defined in Contract Data of Section 6.

3.3.2 The Key dates are mentioned in terms of the time period in number of days reckoned from the commencement date of the Work, and the deliverables for each Key Date shall be achieved by the midnight of the Key Date mentioned. If the Key Date is not achieved as per Contract data, delay damages shall be applicable.

Each Key date includes number of stages for completing the activities these stages are interrelated with flow of activities which may be required in a sequential order; few of the activities/sub-works may be independent to other activities/sub-works which can be programmed for simultaneous or parallel execution. For the purpose of effective monitoring and implementation, certain intermediate stages have to be identified for each Key date.

3.3.3 Interfacing with relevant Project Partners and other agencies for achievement of Key Dates shall be the responsibility of Contractor.

3.3.4 The Contractor shall develop a detailed, logical method of executing the work under the Contract and shall provide programmes which shall reflect the detailed planning of works to be undertaken. In compiling all programmes and in all subsequent updating and reporting, the Contractor shall make provision for the time required for coordinating and completing the design, procurement, construction, testing, commissioning and integrated testing of the works, including design co-ordination, the review of procedures, determining and complying with the requirements of all Government Departments and all others whose consent, permissions, authority or license is required prior to the execution of any work. The Design Submission Programme shall be integrated in to the overall works programme.

3.3.5 The Contractor shall submit the Work Breakdown Structure (WBS) to the Engineer for approval.

3.3.6 The Contractors programme(s) shall be realistic, achievable and shall fully reflect the Employer's requirements, and they shall be accompanied by detailed supporting plans.

3.3.7 Programme activities shall be discrete items of work, which when combined, produce definable elements and components leading to Milestones, Key Interface and Sectional Completion dates and

clearly identify the completion obligations of the Contractor.

3.3.8 Any programme activity creating an imposed time or other constraint shall be fully defined by the Contractor.

3.3.9 Activity descriptions shall clearly convey the nature and scope of the Works. Programmes shall consider the activities of preceding, concurrent, adjacent, and follow on parts and sections of the work under the Contract as well as utility service diversions, new utility installations and connections, and any other activity that may affect the progress of the work under the Contract.

3.3.10 Milestones, Key Dates, Key Interfaces, Sectional Completions and Taking-Over Dates shall be an integral part of all programmes and all activities. Sequencing and interrelationships required to achieve each of these dates shall be shown on the programme.

3.3.11 The programming shall not impose constraints which in any way affect the float or limit the achievement of Key Interface, Sectional Completion or Taking over Dates.

3.3.12 The critical path shall be clearly identified in the programmes, and it shall be fully described in the accompanying programme narrative.

3.3.13 The Contractor's prime point of contact for all matters relating to planning, programming and progress management shall be the Engineer.

3.4 Baseline Programme

3.4.1 Within 28 days of the Commencement Date, the Contractor shall submit the initial 'Baseline Programme' for review and comment by the Engineer/Employer. The Initial Baseline Programme shall;

a. be fully compliant with the Milestone, Key Interface and Taking Over Dates,
b. provide full programme details for the first twelve (12) months of the Contract, and
c. outline details for the remaining period of the Contract.

3.4.2 Within 60 days of the Commencement Date and subsequent to review of initial Baseline Programme, the Contractor shall submit to the Engineer for review and approval a fully comprehensive Primavera Project P6 based, resource and cost loaded Detailed Baseline Programme. The Initial Programme shall be used as the basis for preparing the Contractor's detailed Baseline Programme. In identifying all design, procurement, construction, installation, fitting out, testing and commissioning activities and associated interfaces, the Detailed Baseline programme shall include:

a. a programme showing key design, procurement, manufacturing and construction elements and shall include activity sequences taking into consideration all the interfaces with other project contracts.
b. key plans showing the zones/location mentioned in the programme;
c. narrative explaining contract components, areas, zones methodology, sequence of construction, logistics, temporary facilities, safety and security, traffic and utility diversions, planning, permits and licences, interface management with other construction packages, contractual milestones, imposed constraint dates and any assumptions;
d. a work breakdown structure (WBS) shall be in accordance with the Contract and for review by the Engineer;
e. an activity coding system as defined by the Engineer;
f. cost accrual coding as defined by the Engineer;
g. the critical path of the work under the Contract;
h. a planned progress S curve derived from budgeted cost loaded on to the schedule cumulative and monthly cash flows;
i. long lead item material and equipment delivery schedule;
j. forecasts of all Milestone dates, Key Interface Date, Sectional Completion dates and Taking Over dates;

k. time chainage diagrams, fully in compliance with the Detailed Baseline Programme.

3.5 Programme Submissions

3.5.1 All submissions of programmes and schedules shall include the actual progress of work and a forecast for the remaining work. Actual progress shall be stated in terms of;

a. completed Milestones, Key Interface, Sectional Completion and Taking Over Dates (as defined in the Schedule of Payments) with the corresponding earned value (Earned Value reports along with Actual Cost to Date, Cost to Completion, Schedule and Cost Variances);
b. percentage completions of activities commenced but between Milestones, Key Interface, Sectional Completion and Taking Over Dates; and
c. remaining duration and actual start and finish dates for each activity in the work under the Contract.

3.5.2 The Engineer shall review those Contractor's programme submissions that are in compliance with CC/PCC. If the Programme fails to comply with the Contract or to be inconsistent with actual progress, the Contractor shall amend the programme considering the Engineer's comments and/or requirements and resubmit the Programme in accordance with CC/PCC.

3.5.3 Failure to Make Submissions

Failure of the Contractor to submit any Programme, or any required revisions within the time limits stated shall be sufficient reason for default that the Contractor is not performing the work required in a timely manner, and the Engineer may retain any payment due to the Contractor.

3.6 Construction Update Programme

3.6.1 The Detailed Baseline Programme shall be updated by the Contractor and submitted monthly in the Monthly Progress Report as a Construction Update Programme, or as required at any time by the Engineer. An electronic copy, PDF and Primavera P6 of the Construction Update Programme shall be provided each month to the Engineer.

3.6.2 The Contractor shall produce and submit a summary level report on the Monthly Construction Update Programme for the Engineer's review. This report shall contain the following information as a minimum planning requirement:

a. activity description planned and remaining duration;
b. planned and actual percentage progress, calculated from quantity of works completed;
c. start and finish dates (original);
d. current early start and early finish dates;
e. forecast finish dates as on data dates;
f. actual start and actual finish dates;
g. contractual and monitoring milestone dates and other key dates (original, plan and actual);
h. long lead and critical material milestone dates;
i. a programme for Authorities' Approvals;
j. main interface dates;
k. for all items covered under provisional sums and all variations or other items to be paid under schedules of rates: quantity to complete, actual quantity achieved and remaining quantity to be completed; and an 'S' curve showing actual and planned percentages of progress; and
l. in submitting the Detailed Monthly Construction Update Programme and all updates to it, the Contractor shall ensure that it meets with the requirements of the Contract.

3.6.3 The Contractor shall fully cooperate with the Engineer in the review of the Contractor's programmes, schedules, and any sub-programmes below the Construction Update Programme

3.6.4 The Contractor shall also provide sub programmes completely consistent with, but at a more detailed

level than included in the Monthly Construction Update Programme, including:

a. design, procurement and manufacturing sub programme;
b. construction and installation sub programme;
c. fitting out sub programme;
d. testing and commissioning sub programme.

3.6.5 These sub-programmes shall be updated and issued monthly to the Engineer.

3.7 Supplementary Programmes List

3.7.1 The Monthly Construction Update Programme and sub programmes shall be supplemented by the following, in a format to be agreed with the Engineer:

a. Three (3) month rolling programme;

3.8 Effects on Programme of Delays and Change

3.8.1 The Contractor shall report any potential or actual delays which may affect the sectional key Dates or overall completion to the Engineer in a timely manner and recommend suitable measures to overcome the identified issues.

3.9 Record Keeping and Progress Reporting

3.9.1 **Record Keeping:** The Contractor shall ensure that adequate records are kept of all activities, particularly site activities, including daily site activity records. The Contractor shall ensure that all progress reporting to the Engineer is consistent with these records and shall make these records available to the Engineer on request, in order to examine them and verify submitted reports.

3.10 Progress Reporting

3.10.1 All progress reports to be approved by the Engineer shall be delivered in a format agreed by the Engineer, and in both electronic and hard copy.

3.10.2 Monthly Progress Reports and Dashboards shall be prepared by the Contractor and submitted to the Engineer in four hard and one digital copy.

3.10.3 The first Monthly Progress Report shall cover the period up to the end of the first calendar month following the Commencement Date. Monthly Progress Report shall be submitted monthly thereafter, each within seven (7) days after the last day of the period to which it relates. Cut-off reporting dates, and if deemed necessary revised submission dates, shall be agreed and confirmed by the Engineer.

3.10.4 Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the Completion Date stated in the Taking-Over Certificate for the Works.

3.10.5 Each Monthly Progress Report shall include (in addition to any other information mandated by the Employer's Requirements):

a. charts and detailed descriptions of progress, including each stage of design, Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection, testing, commissioning and trial operation;
b. photographs showing the status of manufacture and of progress on the Site;
c. for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
d. records of the Contractor's Personnel and Equipment;
e. copies of quality assurance documents, test results and certificates of Materials
f. list of Variations, Notices and Claims (Employer and Contractor);
g. safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations, and details of any changes to health and safety and/or environmental management procedures to be adopted to mitigate any breaches in

procedures identified over the reporting period;

h. comparisons of actual and planned progress, with details of any events or circumstances which may jeopardise the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

3.10.6 The Contractor shall issue to the Engineer a Weekly Report and a Dashboard 7th of every month, which shall include a 15-day look-ahead programme. The content of the Weekly Report and Dashboard shall be proposed by the Contractor and approved by the Engineer.

3.10.7 The Contractor shall issue to the Engineer a Daily Dashboard Report before 10.00 AM the following working day. The content of the Daily Dashboard Report shall be proposed by the Contractor and be approved by the Engineer.

3.10.8 **Progress Review Meetings**

a. Biweekly meetings will be held to review and monitor the progress of the project work, and they shall be convened by the Engineer. The Contractor's representative and if necessary, representatives of all interfacing Project Partners shall attend the meetings. The Employer may also be present at the meetings.

b. Quality, Health and Safety, Environmental and Design workshops/meetings will be held biweekly, or as deemed necessary by the Engineer, to ensure open transparent communication with regards to issues and progress of the Works.

c. The Contractor shall conduct separate meetings with interfacing contractors and stakeholders as necessary to clarify technical aspects of the systems and their requirements.

d. A quarterly Progress Review meeting will be held with the Employer. All the members of the Contractor (single company/consortium/JV) who are holding power of attorney for representing their firm(s) must be present at this meeting.

e. The Contractor shall prepare draft minutes recording all matters discussed and decisions recorded at all the meetings within 48 hours for the Engineer's review. These minutes shall be approved by the Engineer.

3.11 Exception Reporting

3.11.1 Where matters arise, which are urgent or deviate substantially from the latest report the Contractor will not wait until the next monthly report but shall prepare a specific 'Exception Report' concerning the new situation and submit this to the Engineer.

3.12 Visuals Reporting

3.12.1 Photographs

3.12.1.1 Following award of the Contract the Contractor will engage a professional photography service to carry out the following for the work under the Contract:

a. Colour photographs shall provide a fair representation of the progress of the work under the Contract.

b. A minimum of 48 photographs per month/each station shall be submitted as a bound booklet to the Engineer, along with a digital copy of the same.

c. Photograph locations shall be proposed by the Contractor and confirmed by the Engineer.

d. Photographs shall be taken using a high-resolution digital camera and picture files and shall be provided in raw data format. The resolution, minimum 24 megapixels, of photographs shall be sufficient for clarity when photographs are enlarged to A4 size. All photographs shall be time stamped by the camera.

e. Each monthly set of photographs shall be accompanied by an index indicating the subject, date, locations and directions in which the photographs were taken.

f. The Contractor shall provide six hard and two soft copies (on a DVD/Data card) of the photo booklet and of each selected photograph.
g. The photographs, electronic format and albums shall become the property of the Employer.
h. The photographs shall be taken by a professional photographer who shall be proposed by the Contractor and approved by the Engineer.

3.12.2 Recording of DVD

3.12.2.1 The Contractor shall submit video recordings of the project which shall have Hindi/Kannada and English audio commentary.

3.12.2.2 Every month, the Contractor shall submit a 30-minute full high-definition Drone video (5K Camera) recording, one with audio commentary in Hindi/Kannada and a second in English, of the work under the Contract to the Engineer as part of his Monthly Progress Report. In addition, Contractor shall submit a 30-minute full high-definition video (1080P) recording, one with audio commentary in Hindi/Kannada and a second in English, of the work under the Contract to the Engineer as part of his Monthly Progress Report. Upon completion of the work under the Contract, the Contractor shall provide a professionally edited full high-definition video (1080p) to the Engineer showing progress through the period of the Contract. The video shall be a minimum length of20 minutes and cover the design, construction, manufacture and installation of all major components of the work under the Contract.

3.12.2.3 All videos shall be produced by skilled video camera person with professional equipment.

3.12.2.4 All videos shall present a comprehensive record of the manufacture and construction of the work under the Contract to a non-technical audience and the Contractor shall provide any visual aids or graphical representations required to illustrate particular points, in liaison with the Engineer.

3.12.2.5 Original video clips and all videos produced from them shall become the property of the Employer. The Contractor shall be responsible for the safe archiving of the original video materials during the progress of the work under the Contract and shall transfer this complete archive with the as-built documents.

3.12.3 **Site webcams**

3.12.3.1 Within 60 days of commencement of the work by the Contractor shall propose a system to the Engineer for approval to provide live monitoring at each station site on a 24-7 basis. This shall be done by installing at least four video cameras for each station capable of capturing live high-resolution video and a high-resolution time-lapse camera {capturing every 15 minutes} for archiving and documentation purposes at locations to be agreed with the Engineer. A secure password internet log-in access to the site webcams shall be provided to Engineer/Employer.

4 Health and Safety Management

4.1 Compliance

4.1.1 The Contractor shall fully comply with the requirements of CC, PCC, and Section 8C.

4.1.2 Employer's Health and Safety Policy and Manual. Compliance with the Employer's requirements shall not relieve the Contractor of any of their statutory duties, obligations or responsibilities under the Contract or Law.

4.1.3 The Engineer reserves the right to order the immediate removal and replacement of any item of Contractor's equipment or personnel, which is deemed to be in an unsafe condition or who carries out a serious safety violation.

4.1.4 The Contractor shall document and implement a self-certifying Health and Safety Management System (HSMS) that shall remain in effect during the execution of the work under the Contract.

4.1.5 The Contractor's HSMS shall be in compliance with OHSAS 18001.

4.1.6 Within 28 days of the Commencement Date, the Contractor shall submit the following for review by the Engineer:

a. health and safety policy;
b. health and safety plan;

c. health and safety manual.

4.1.7 For any amendment to the HSMS documentation, the Contractor shall as soon as practicable prepare and submit the proposed amendment for review by the Engineer prior to implementation.

4.1.8 The Contractor shall provide and enforce at all times the wearing of efficient safety helmets and work shoes and, where necessary, eye goggles, ear protectors, safety harnesses and other personal protection equipment for all personnel.

4.1.9 Fire Safety Regulations and other requirements pertaining to fire safety included in the Contract shall be observed at all times.

4.1.10 The Contractor shall ensure that all gases, fuels 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.

4.1.11 The Contractor shall be responsible for obtaining any requisite licenses.

4.1.12 No operation involving ionizing or electro-magnetic radiation shall be carried out without the approval of a safety officer.

4.1.13 The Contractor shall ensure that all personnel and members of the public are properly protected from the effects of any radiation emitted from the project site. All radiation areas shall be prominently posted with appropriate signs and exclusion barriers.

4.1.14 The Contractor shall provide adequate stand-by generating plant, equipment and spares for illumination of the site of the Works at all times to ensure the safety of project personnel, the Works and the public.

4.1.15 High standards of housekeeping shall be established. All materials shall be stored in an orderly and safe manner. Rubbish and debris shall be disposed of daily.

4.1.16 Measures shall be taken to prevent mosquito breeding within the works area, or areas to which the Contractor has access, which shall include the following:

a. Empty cans, oil drums, packing and other receptacles which may retain water shall be deposited at a central collection point in accordance with the environmental regulations in force and shall be removed regularly; and

b. Standing water shall be treated at least once every week with environmentally friendly materials which shall prevent mosquito breeding.

c. To avoid mosquito breading the any Contractor's plant or other equipment and facilities that may retain water shall be stored, covered in such a manner that water shall not be retained or treated as deemed necessary.

d. Posters in English, Kannada, and Hindi languages drawings attention to the danger of permitting mosquito breeding shall be displayed prominently on the site.

4.2 Legislation, Codes of Practice

4.2.1 The Contractor shall, in performing the Contract, comply with all applicable Indian Laws including:

a. all current and future enactments, codes of practice and safety guides (specifications or other government bodies' requirements);

b. when interfacing with stakeholders, the Contractor shall comply with their requirements.

4.2.2 These documents are the minimum standards to be achieved by the Contractor and do not relieve the Contractor of liability to comply with all relevant Indian Laws. Where there is a discrepancy in the documents, the higher or stricter standards shall take precedence.

4.3 Management Responsibility

4.3.1 The Contractor shall be fully responsible for the safety of the Site, for the Works, their personnel, Subcontractors' personnel, the public and all persons directly or indirectly associated with the Works under the Contract, on or in the vicinity of the Works.

4.3.2 The Contractor shall be fully responsible for submitting reports, notices and information to all

stakeholders where there is a statutory requirement to do so.

4.4 Subcontractors

4.4.1 The Contractor and all Subcontractors, and any person authorised by the Contractor to be on the Site, shall comply in every respect with the provisions of the Contractors health and safety management system.

4.4.2 The Contractor shall ensure that proper and adequate provisions are included in all Subcontracts placed by him, and in all Subcontract documentation.

4.4.3 The safety standards of any proposed Subcontractor are to be assessed by the Contractor prior to the placing of any subcontract.

4.5 Breach of Health and Safety Obligations

4.5.1 Serious or repeated breaches of the health and safety statutory regulations, rules of the Site, or other disregard for the health and safety of any person, are reasons for the Engineer to exercise their authority to require the removal from the Site of any person employed by the Contractor or subcontractor.

4.5.2 The Engineer shall have the right to order the suspension of any or all of the Contractor's and subcontractor activities where it is deemed that to continue such work activity or activities may pose a hazard to the safety of persons or property.

4.5.3 Where the Engineer orders a suspension of the Contractor or subcontractor work activities the suspension shall continue until the Contractor has satisfied the Engineer that corrective action has been taken to eliminate the hazard that was the subject of the suspension.

4.5.4 For all serious safety violations, the Employer reserves the right to penalise the Contractor on the recommendation of the Engineer. These penalties shall be determined and recovered at the Employer's discretion dependant on the severity of the incident, including but not limited to the conditions indicated **Section -8C SHE. Part-V Penalty & Awards.**

a. 'Grievous' injuries shall be taken as injuries as defined in Section 320 of the Indian Penal Code, as confirmed below: -
   i. Emasculation.
   ii. Permanent privation of the sight of either eye.
   iii. Permanent privation of the hearing of either ear.
   iv. Privation of any member or joint.
   v. Destruction or permanent impairing of the powers of any member or joint.
   vi. Fracture or dislocation of a bone or tooth.
   vii. Any incident which endangers life, or which causes the sufferer to be, during the space of twenty days, in severe bodily pain or unable to follow ordinary pursuits.

b. Major Accidents shall be defined as;
   i. An incident involving the loss of life;
   ii. Ten or more multiple injuries;
   iii. Explosion or fire resulting in on-site or off-site emergencies;
   iv. The release of toxic chemicals resulting in on-site or off-site emergencies;
   v. Spillage of hazardous chemical resulting in on-site or off-site emergencies;
   vi. Damage to utility services and equipment leading to an outage or process stoppage;
   vii. A definable adverse effect to the public, unplanned closure of trafficked roads or the environment.

4.6 Contractor's Documentation

4.6.1 Within 28 days of the Commencement Date, the Contractor shall submit a copy of their health and

safety policy and plan plus their draft health and safety manual for approval by the Engineer. The Contractor's health and safety manual shall be developed to reflect the progress of the Works and shall establish the required health and safety processes in advance of each of the phases.

4.6.2 The Contractor shall provide their Subcontractors with copies of the relevant health and safety documentation throughout the project. This shall include plans, manuals, safety risk assessments, hazard logs and method statements as appropriate. THE Contractor shall monitor the Subcontractors comply with all the documentation.

4.6.3 **Health and Safety Plan (HSP)**

a) The Contractor shall devise and implement a health and safety plan to fully comply with the requirements of the Contract.

b) The HSP plan shall include a policy statement signed by the Chief Executive Officer of the Contractor (or other senior company officer) declaring that occupational health and safety shall be given the highest practicable priority in all aspects of the Contract and in the discharge of their contractual obligations.

c) The HSP plan shall include and confirm as a minimum:

i. identification of personnel responsible for health and safety management and reporting, with their responsibilities.
ii. training and competency assessment for staff and Subcontractors;
iii. procedures and forums for identifying health and safety risks and issues;
iv. specific requirements of the Site and other work Sites;
v. requirements of the Contractor's corporate Health and Safety Management System.
vi. adequate mandatory induction and training is provided to personnel working on, and using, the Site;
vii. access is only available to authorised personnel and registered visitors:
viii. all personnel must attend an induction covering:
ix. All personnel on the Site must be identified by means of a prominently displayed identification card (provided by the Contractor), which shall be in a tamper-proof format reviewed by the Engineer and shall include the following information:

- Company Logo
- Company Contact Info
- Cardholder Name
- Cardholder Photo
- Cardholder Signature
- Cardholder Title
- Card holder ID Number
- Issue/Expiration Date

x. each visitor to the Site is registered and managed.

4.7 Job Hazard Assessments (JHA's)

4.7.1 The Contractor shall carry out a detailed JHA's (health and safety risk assessments) covering the occupational health and safety aspects of the work under the Contract. All detailed JHA's shall be submitted to the Engineer 14 days prior to the commencement of work on site.

4.7.2 The documentation arising from the detailed JHA shall contain a comprehensive schedule of all perceived risks and the proposed resolution or mitigation measures necessary to reduce these risks to a minimum. The findings of the assessment shall be incorporated into the HSP and relevant method statements. The nature of the work under the Contract environment dictates that the JHA requires regular reviews and updates. JHA's shall be included as part of all method statement submittals.

4.7.3 The Engineer reserves the right to request the Contractor to conduct a JHA and document a method statement for hazardous works as and when deemed necessary.

4.8 Contractor's Safety Arrangements

4.8.1 Co-ordination of Work Activities

a) The Contractor shall ensure that Work is coordinated so that the activities of one group of workers do not affect the safety of another group.

b) Daily meetings shall be held to coordinate the Work activities, with permits to work issued where and when required.

4.8.2 Permit to Work

a. The Contractor shall implement a permit to work procedure that facilitates the control of hazardous works, as identified during the risk assessment.

b. The permit to work procedure for the work under the Contract shall be submitted to the Engineer for review within 45 days of the Commencement Date.

c. The permit to work procedure is critical to the well-being of all persons who participate in the work under the Contract and the public. The Contractor shall ensure that any amendments to this procedure are communicated to all persons involved in or around the work under the Contract.

4.8.3 Safety Inspections

a. The Contractor shall conduct dedicated Site safety inspections once a week as a minimum, which shall be attended by the Contractor's most senior Site staff and safety management.

b. A brief report of the inspection shall be made and issued to the Engineer. The report shall include the actions taken to resolve any problems or shortcoming discovered during the inspection. The report shall be made available for audit purposes, and shall be discussed at safety meetings.

c. A comprehensive health and safety inspection check-list for the use of the Contractor's Site staff when inspecting the Site is to be formulated by the Contractor and submitted for review by the Engineer.

d. The checklist shall indicate the standard to be achieved on any particular aspect of health and safety and be compiled in such a way that allows the inspector to enter their actual findings for instant comparison and subsequent rectification.

e. When completed the checklist shall be kept for record purposes and be made available to the Engineer for audit purposes.

f. A grading system is to be established which grades the area inspected as either acceptable or unacceptable.

g. Where an area receives a grading of unacceptable, immediate action is to be taken to rectify the problems raised, and a further audit shall be conducted after 7 and 14 days to assess the conditions.

h. The Contractor is to advise the Engineer of the date of the safety inspections. The Engineer may send a representative to assess the thoroughness of the inspection.

4.8.4 Engineer Safety Audits

a. The Engineer may conduct safety audits to confirm the effectiveness of the Contractor's health and safety management system.

b. The outcome of the Engineer's audit will be graded as either acceptable or unacceptable.

c. Where the Contractor receives a grading of unacceptable, immediate action is to be taken by the Contractor to rectify the problems raised. A follow up audit shall, if necessary, be conducted by the Engineer within 30 days to access whether satisfactory remedial action has been taken.

d. The Contractor shall continue to be audited, every 30 days, until such times as a grade of

acceptable has been achieved.

4.8.5 Internal Safety Audits

a. The Contractor shall regularly, at periods not greater than 30 days, conduct internal safety audits on both the health and safety management system and the physical Site conditions. The audits shall be performed to the same criteria and using the same grading and benchmarking as the Engineer's audits.

b. The audits shall be conducted by person(s) who are qualified and competent to carry out safety audits. The documentation generated by the audit process, including score sheets, shall be made available to the Engineer for audit purposes.

c. The audits shall include the work of subcontractors.

d. The Contractor shall advise the Engineer of the date of all the audits. The Engineer may send a representative to assess the thoroughness of the audit.

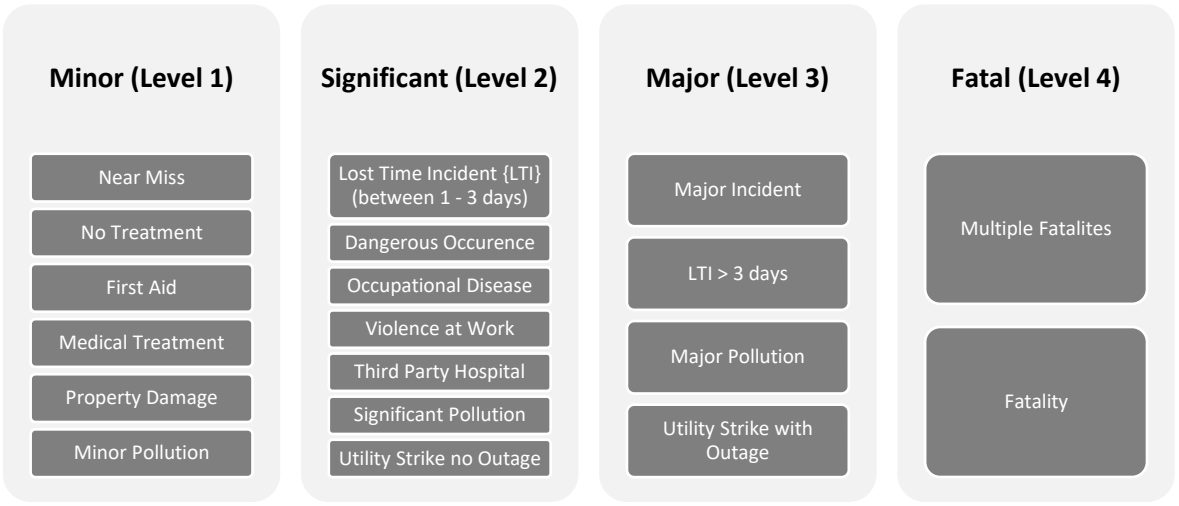
4.8.6 Reporting of Accidents, Incidents and Dangerous Occurrence

a. Within 45 days from the Commencement Date and before any construction work commences on site the Contractor shall submit to the Engineer an Emergency Escalation Tree. The Emergency Escalation Tree shall be in compliance with the Employer's Health and Safety Manual.

b. The Contractor shall notify the Engineer immediately of any incident, dangerous occurrences or accidents, which results in death, serious bodily injury, or incapacity or damage to the Employer's property (see table below for severity). Initial notification may be verbal but shall in any event be followed by a preliminary written report, in a format reviewed by the Engineer, within 24 hours of the occurrence/accident and a detailed written report shall be submitted within seven (7) days.

c. The Contractor shall report all incidents to the Engineer and Employer and relevant authority, or other stakeholders as required. The format and mechanism for this reporting shall be confirmed by the Engineer.

d. The Contractor shall submit at the end of each week a list of persons who are on sick leave following an accident on the Contract to the Engineer.



4.8.7 Monthly Reports

a. The Contractor shall submit a Monthly Health and Safety Report separate to the Monthly Progress Report. Prior to submission, the Contractor's Representative and Health and Safety Manager shall endorse the Site safety report.

b. The Monthly Health and Safety Report shall comprehensively address all relevant aspects of health and safety and shall contain certain standard forms and information as directed by the Engineer, for statistical analysis.

c. The Contractor shall submit reports or accident analysis, in the agreed format, as and when required by the Engineer.

d. The Contractor will be required to provide safety performance data (Key Performance Indicators) as required by the Engineer, in order to measure the Contractor's compliance with all applicable Laws, Contractor's health and safety manual and health safety plan.

4.8.8 Emergency Procedures and Facilities

a. The Contractor shall establish and implement emergency procedures. The Contractor shall prepare a Security and Emergency Plan, which is to be submitted to the Engineer for approval.

b. The Contractor shall submit within 45 days an Emergency Call-Out Escalation Matrix. The format of the Emergency Call-Out Escalation Matrix shall be approved by the Engineer. The Emergency Call-Out Escalation Matrix shall be updated monthly and included in the Monthly Health and Safety Report.

4.8.9 First Aid Facilities

a. The Contractor shall provide first aid provisions in accordance with Indian Law. Arrangements for transporting the injured (ambulance, stretcher, etc.) shall be provided. Plans for the provision of trained first aid personnel shall be reviewed by the Engineer.

b. Provisions shall include trained personnel and facilities appropriate to the Site conditions. First aider competency shall be demonstrated by attendance and certification at a licensed establishment for at least one day for basic first aider and three (3) days for advanced first aiders.

c. Trained first aid personnel shall be in attendance at all times at the Site during working hours.

d. The Contractor shall maintain a register of all persons receiving first aid treatment. Records shall be in a comprehensive format and submitted weekly to the Engineer, and where necessary to the relevant authority, and shall be retained for audit purposes.

e. First aid kits, as required by the relevant authority, shall be made available in all Site vehicles.

f. First aid kits shall be made available where work under the Contract is in remote areas.

4.8.10 Site Transport and Equipment

a. The Contractor shall ensure that all Site vehicles are regularly maintained and kept in a safe condition with fully working brakes, reversing horns, lights, exhaust, windscreen, windows and doors, and the like.

b. Each vehicle, piece of equipment or machinery shall be uniquely and clearly identified and registered for maintenance purposes.

c. When directed by the Engineer, the Contractor shall remove any vehicle from the Site that is not up to the standards required.

d. All Contractors' Equipment used on the Works shall be less than five (5) years old at the commencement of the Contract. If the Contractor proposes to use any equipment older than five years old, they shall first seek the approval of the Engineer before mobilisation on site.

4.8.11 Work over Public Areas

All activities requiring lifting, launching, or otherwise working over public areas, shall be performed in accordance with a method statement which shall be submitted to the Engineer for review and comment.

4.8.12 Site Security

a. The Contractor shall take all necessary practicable precautions to prevent trespass onto the Site, whether it is intentional or unintentional.

b. The Contractor shall provide Site security on a 24/7 basis and this shall include lighting, signage

and security personnel for the protection of the work under the Contract so as to prevent theft and/or damage to plant, equipment vehicles or materials.

5 Quality Management

5.1 Compliance

5.1.1 The Contractor shall comply with CC/PCC and Appendix III Employer's Requirement part-1.

5.1.2 The Contractor shall document and implement a self-certifying Quality Management System (QMS) that shall remain in effect during the execution of the work under the Contract.

5.1.3 The Contractor's QMS shall be in compliance with ISO 9001.

5.1.4 The Contractor's QMS documentation shall include but not be limited to the following:

a. quality manual;
b. quality plans;
c. quality procedures and work instructions;
d. forms and templates;
e. guidance notes;
f. inspection and test plans (ITP's);
g. request for inspections (RFI's);
h. compliance plan.

5.1.5 The overall philosophy for quality in all aspects of the work under the Contract shall embody a 'Right First Time' culture and of continuous improvement via the methodology of **plan, do, check, act cycle** as confirmed in ISO 9001. In particular, the Contractor shall provide evidence that the following areas of quality management are detailed within the QMS:

a. management responsibility;
b. promote a 'right first time' approach;
c. minimise reliance on inspection;
d. continuous improvement;
e. customer satisfaction is achieved.

5.1.6 Within 28 days of the Commencement Date, the Contractor shall submit the following for review by the Engineer:

a. quality policy;
b. quality manual;
c. quality plans.
i. Design quality plan
ii. Manufacturing Quality Plan
iii. Construction Quality Plan

5.1.7 For any amendment to the QMS documentation, the Contractor shall as soon as practicable prepare and submit the proposed amendment for review by the Engineer prior to implementation.

5.2 Contractor's Documentation

5.2.1 Quality Manual

The Contractor's quality manual is to be regularly updated to reflect changes to work practices and/or changes to policy and legislation. The proposed changes are to be submitted to the Engineer for review prior to inclusion and implementation.

5.2.2 Quality Plans

5.2.2.1 Quality plans shall be based on those outlined by ISO 10005:2018 and shall define all measures necessary to meet the requirements of the Contract at all appropriate phases of the work under the Contract.

5.2.3 Inspection and Test Plans (ITP)

30 days prior to the Commencement Date of all major work activities requiring test and/or inspection the Contractor shall produce and issue to the Engineer for approval a draft outline of the ITP(s) for the work activity. Each ITP shall identify the quality objectives and include, without limitation:

i. the personnel responsible for undertaking and certifying the inspection and/or testing;
ii. the procedure or instructions for the inspection and/or testing;
iii. the test method or a reference to the relevant standard of testing;
iv. the inspection and/or testing required prior to commencement of an activity;
v. the inspection and/or testing during an activity and its frequency;
vi. the inspection and/or testing required to complete an activity;
vii. all hold points;
viii. all witness points;
ix. any notices or other documents to be given to the Engineer in relation to witness points and hold points;
x. the compliance criteria;
xi. the method of analysis of test data;
xii. the procedure for correction or disposal of any work which fails the compliance criteria;
xiii. examples of the documentation to be used for reporting the results of inspections, tests and the analysis of test data;
xiv. examples of the documentation to be used for recording the status of inspections and tests;
xv. the procedure for the distribution, filing and storage of inspection reports, test reports and reports on analysis of test data.

a) The Contractor shall plan, perform and record all quality control activities to ensure that all work is performed in accordance with the QMS documentation reviewed by the Engineer and in compliance with the requirements of the Contract.
b) The Engineer may require the Contractor to carry out further additional inspections and/or tests as are in their opinion appropriate.

5.2.4 Quality Management Staff

The Contractor shall appoint competent Quality Engineers and support staff in sufficient numbers to ensure the effective function of the Quality Management discipline.

5.2.5 Reports of Inspections, Tests and Trials

The Contractor shall supply reports of each inspection and/or test. Such reports shall show the results of all the inspections and/or tests carried out and shall certify that the work has been inspected and/or tested in accordance with the requirements of the Contract and in compliance with the requirements of the Contract.

The Contractor will ensure that inspections requiring ongoing monitoring and improvement to ensure minimal rework and right first time are implemented.

Each report of inspection and/or test shall be signed by a representative of the Contractor who has the necessary authority.

The Contractor shall ensure that a signed copy report of any on and off-Site inspection/test is filed in his records within a reasonable time period, and no more than 30 days.

Lab Tests for Soils:

Conducting various Laboratory tests on soil, UDS samples, at any Laboratory Testing Facility accredited by NABL or any other accreditation body which operates in accordance with ISO/IEC 17011 and accreditation in compliance with ISO/IEC 17025 for testing and calibration scopes, including

preparation of soil samples to determine the properties of soil, all complete as per specifications

Lab Tests in Rock:

Conducting various Laboratory tests on rock samples, at any Laboratory Testing Facility accredited by NABL or any other accreditation body which operates in accordance with ISO/IEC 17011 and accreditation in compliance with ISO/IEC 17025 for testing and calibration scopes, including preparation of rock samples to determine the following properties of rock, all complete as per specifications

A fully equipped laboratory for concrete quality testing shall be established on site along, with laboratory technicians and support staff. Testing machines shall be periodically calibrated in accordance with Indian Standards requirements.

5.2.6 Quality Control Register

a) The Contractor shall provide and maintain at all stages of the Work a quality control register or registers to identify the status of inspections, sampling and testing of the Work, and all certificates. These registers shall be maintained as current at all times.

b) The Contractor shall submit monthly digital summaries based on each quality control register to the Engineer. Each quality control register shall show the type and amount of certification received and the sampling, inspection, and/or testing undertaken on each element of the work under the Contract during the previous month. The summaries shall identify and demonstrate the compliance of such certification, sampling, inspection and/or testing with the requirements of the Contract and shall identify any item which does not conform to the requirements of the Contract, including:

i. a list of the certificates received for each batch of manufactured goods or materials incorporated in the work under the Contract and compare this against the certification required by the Contract and the Contractor's quality plans;

ii. a list of the inspection, sampling and testing activities undertaken by the Contractor on each element of the work under the Contract and compare these activities against the amount of inspection, sampling and testing required by the Contract and the Contractor's quality plans;

iii. the results of each report of inspection and/or test and any required analysis of these results and compare these results against the acceptance criteria;

iv. reference to any actions proposed by the Contractor to overcome any non- conformities identified by the Contractor and by the Engineer; and

v. a nonconformity register to indicate the status of all nonconformities.

5.3 Quality Management System Information

5.3.1 The Contractor shall make available a copy of quality bulletins in each of his site offices, workshops, canteens and site notice boards. All bulletins shall be translated into languages, which are understood by labour engaged by the Contractor or subcontractors. Posters in Hindi, Kannada, English, and other languages understood by the workers to draw attention to quality polices shall be displayed prominently in relevant areas of the Site.

5.3.2 The Contractor shall ensure that QMS matters are given a high degree of publicity to all persons on the Site.

5.3.3 The Contractor will ensure all quality documents including records must be available upon request from the Engineer.

5.3.4 The Contractor shall make available on the Site a complete and up to date set of QMS documentation including but not limited to policies, procedures, guidance notes, work instructions templates, forms, etc.

5.3.5 The Contractor shall also keep a working stock of all necessary forms, ensuring the latest version is

available, as required by the QMS.

5.4 Audits

5.4.1 The Contractor shall ensure that audits of all the activities in each quality plan are carried out at quarterly intervals, or at such other intervals as the Engineer may require, ensuring the continuing suitability and effectiveness of the quality system. Reports of each such audit shall be submitted promptly to the Engineer.

5.4.2 The Contractor shall submit for review by the Engineer details of qualifications and experience of personnel assigned to carry out audit and inspection and testing activities.

5.4.3 Upon receipt of a Corrective Action Request (CAR), Non-Conformance Report (NCR), or similar as a result of a quality audit, the Contractor shall submit to the Engineer for review a proposed corrective and preventative action plan as required.

5.4.4 Quality audits may be conducted by the Engineer to ensure the continuing suitability and effectiveness of the Contractor's QMS.

5.4.5 Internal Audit

The Contractor shall continuously monitor the performance of the QMS and shall specifically include in each monthly progress report:

a) the status of all QMS documentation;
b) an up-to-date audit schedule and status;
c) an up-to-date non-conformity register providing the status of all non- conformities identified by the Engineer and the Contractor;
d) any other items as instructed by the Engineer.

5.5 Quality Control Requirements

5.5.1 The Contractor shall prepare and maintain a list of quality control points which establish the criteria for control of each major component or activity during design, construction, manufacture, installation and commissioning, in accordance with the quality requirements of the Contract.

5.5.2 Before being brought to the Site, any goods proposed by the Contractor shall be assessed by the Contractor for their compliance with the Employer's Requirements.

5.5.3 Formal records of quality control inspection shall be retained by the Contractor, and be accessible to the Engineer as and when required.

5.5.4 The identification and storage of goods on Site shall be controlled such that the quality control status can be readily understood.

5.5.5 The Contractor shall give the Engineer reasonable notice, generally seventy-two (72) hours, of when relevant work will be inspected and/or tested by the Contractors QC team.

5.5.6 The Engineer may elect to witness inspections and/or tests by the Contractor in relation to all quality control points. Witness by the Engineer shall not discharge the Contractor of the responsibility to provide compliant product, nor shall it preclude subsequent rejection by the Engineer.

5.6 Notice of Place of Manufacture and/or Source of Supply

5.6.1 The Contractor shall notify the Engineer of the places of manufacture and/or the source of supply of all goods to be incorporated into the work under the Contract.

5.6.2 The Contractor shall give reasonable notice (which shall not in any event be less than 30 days) to the Engineer before the start of any manufacturing and/or the supply of goods.

5.7 Quality Training

5.7.1 The Contractor shall submit the material for the quality induction training to the Engineer, prior to conducting quality training sessions.

5.7.2 The Engineer has the right to request the Contractor's quality training records.

5.7.3 The Contractor shall keep records of such training for quality audit purposes. Upon completion of their training, the Contractor's site staff shall sign a copy of their assigned safety responsibility statement, which shall be kept by the Contractor for audit purposes.

5.7.4 The Contractor is to report the number of QMS training sessions and employees trained each month, at the QMS Committee meeting and in the monthly report.

5.7.5 Design Management. Design Management

5.8 Contractors Compliance and Obligations

5.8.1 The Contractor shall comply with all Legal requirements and the Employer's Requirements.

5.8.2 Whilst work under the Contract is being performed, one complete set of the Employer's Requirements, the Design Documents and other written information supplied by the Employer, the Engineer, the Contractor, any Subcontractors or consultants shall be kept by the Contractor at the Site or other location approved in writing by the Employer and shall be available at all times for reference by the Employer, the Engineer and any persons nominated in writing by either of them.

5.8.3 During the manufacture or assembly of any significant part of the work under the Contract away from the part of the Site where the Works are to be constructed, a set of the drawings and written information relevant to that part of the work shall be kept by the Contractor at the place of manufacture or assembly and shall be available for reference by the Employer, the Engineer and any persons nominated in writing by either of them.

5.8.4 All design work by or on behalf of the Contractor shall be prepared by qualified designers who are engineers or other professionals who comply with the criteria (if any) stated in the Employer's Requirements, and they shall be known as the Designer. The Designer shall have experience, which shall be as stated (if any) in the Notice Inviting Tender of Section I. Unless otherwise stated in the Contract, on award of the Contract the Contractor shall submit to the Engineer for consent the names and particulars of the Designer.

5.8.5 The Contractor shall warrant that he, his designers, any design subcontractors or other consultants have the experience and capability necessary to design the Works to the relevant standards. The Contractor undertakes that the designers shall be available to attend discussions with the Engineer at all reasonable times, until the expiry date of the relevant Defects Notification Period.

5.8.6 Biweekly Design Workshops will be arranged to monitor design progress, agree key element parameters and to promote transparency in the design process. The Contractors and Designer Key Personnel related to design shall attend the Design Workshops until such time the Engineer deems the frequency can be increased or they are no longer required.

5.9 Design Submittal

5.9.1 The Contractor shall send all design submittals to the Engineer under the cover of a Transmittal Form. The Transmittal Form shall be sequentially numbered and signed in accordance with the Document Control Index. A separate Transmittal Form shall be used for each submittal.

5.9.2 The Contractor shall provide supplemental information with each submittal in sufficient detail to completely explain the subject of the design submittal.

For designs that are on the Programme Critical Path the Engineer shall respond as per CC/PCC. Where designs are not on the Programme Critical Path the Engineer shall use his best endeavours to respond within a reasonable time so as not to delay the progress of the Works. These review periods shall commence the day after the Engineer receives a Contractor's Document and the Contractor's notice. This Contractor's notice shall state that the Contractor's Document is considered ready, both for review in accordance with this Clause and for use. The Contractor's notice shall also certify that the

Contractor's Document complies with the Contract, or the extent to which it does not comply.
The Engineer may, within the review period, give notice to the Contractor that a Contractor's Document fails (to the extent stated) to comply with the Contract. If a Contractor's Document so fails to comply, it shall be rectified, resubmitted at the Contractor's cost and reviewed. If the Contractor's Document complies with the Contract, the Engineer shall issue a Notice of No Objection (NONO), unless expressly stated in the Contract that he shall approve or review the Contractor's Document. Design submittals will be reviewed by the Engineer who will respond with one of the following comments:

a. In the case of a Contractor's Document which has been submitted for the Engineer's review the Engineer shall issue a Notice of No Objection (NONO) to the Contractor indicating that the Engineer does not object to the Contractor's Document,
b. or a statement of No Objection with Comments (NOWC) and confirmation whether work may commence on the acceptance the Contractor will close out the Engineer's comments,
c. or shall issue a statement that the Contractor's Document fails (to the extent stated) to comply with the Contract.

5.10 Design Plan

5.10.1 The Contractor shall prepare and submit a Design Plan for the design of the Works within 45 days from commencement.

5.10.2 The Contractors Design Plan shall identify protocols for progressive design assurance. This Design Plan shall include the provision of intermediary design review gates for each design element, at which the Engineer will be kept appraised of the Contractors Design.

5.10.3 The Design Plan shall define the Contractor's policy for the design of the Works and shall, without limitation define:

a. the list of procedures and work instructions to be applied to manage and control the quality of the design work, including:
   i. the design and performance requirements which shall be defined in terms of basic data and design assumptions made; relevant codes, standards and regulatory requirements; safety, reliability, security and environmental requirements; and commissioning requirements;
   ii. design methods including software applications to be used in the design, both proprietary and public domain, including any requirements for physical and mathematical model testing;
   iii. preparation, checking, issue, distribution, indexing and filing of reports, calculations, drawings and specifications together with the means for their revisions;
   iv. Contractor's design review, authorisation and approval of design documentation.

5.11 Design Submission Programme

5.11.1 The Contractor shall prepare and submit with 30 days from the Commencement Date a 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 Definitive Design Submission and the Construction Reference Drawings Submissions.

5.11.2 The Design Submission Programme shall:

a. make adequate allowance for the design and development of specialist works;
b. be consistent with and its principal features integrated into the Works Programme, and show all relevant Key Dates;
c. identify dates and subjects by which the Engineer's decisions should be made;
d. make adequate allowance for periods of time for review by the Engineer and other review

bodies;

e. include a schedule identifying, describing, cross-referencing and explaining the Design Packages into which the Contractor intends to divide the Definitive Design and Construction Reference Drawings; indicate the Design Interface and Co-ordination periods for each Designated Contractor.

5.12 Design Quality Checking Plan

5.12.1 The Contractor shall prepare and submit a Design Quality Checking Plan for the design of the Works within 60 days from the Commencement Date. The Design Quality Checking Plan is a design quality document and shall confirm how the Contractor and their Designer(s) will quality check each submission to the Engineer.

5.12.2 The Design Quality Checking Plan shall confirm;

a. the objectives of the checking of each design stage to ensure the required quality of work is achieved;
b. defined input and output criteria for each design stage;
c. identification of types and detailed methods of checking activities to be carried out;
d. the Contractor's approach to progressive design assurance;
e. detailed planning of checking activities to be carried out, including schedules, resources and approval authorities;
f. selection and utilisation of the test equipment, and their test environmental conditions;
g. acceptance criteria on which the design is demonstrated, to be in accordance with and traceable to the Employer's Requirements;
h. demonstrating how the Employer's Requirements have been met.

5.13 Design Submission Stages

5.13.1 The following design submissions shall be made by the Contractor for the Engineer's review:

a. Detailed Design Stage 1 {DS1};
b. Detailed Design Stage 2 {DS2};
c. As-built Drawings.

5.14 Detailed Design Stage 1 {DS1 - Preliminary}

5.14.1 The Contractor shall prepare the DS1 based on the Employer's Requirements.

5.14.2 In order to complete the DS1, the Contractor shall have coordinated basic details of spatial requirements for Railway Systems, environmental control systems and MEP.

5.14.3 The preliminary structural design shall be sufficiently well developed to confirm that the spatial provisions given in the layout drawings are necessary to suit all interfacing requirements and can be achieved.

5.14.4 The preliminary design shall include a set of drawings and 3D BIM models to define the basic layout of the public and plant room areas, in sufficient detail to allow the Railway Systems, environmental control systems and MEP designers to confirm their finalised plant and equipment room layouts.

5.14.5 The preliminary design submission shall include but not be limited to the documents, drawings and models outlined in this section. The Contractor shall prepare a table of contents, listing all drawings, specifications, calculations and other documents included in the submission.

5.14.6 DS1 (Preliminary) submission shall include but not be limited to:

a. the quality assurance plan for design
b. design status report;
c. the submission of proposed softwares

d. the preliminary equipment layouts and details
e. the preliminary maintenance analysis
f. the submission of specifications proposed for the work
g. preliminary station sizing
h. alignment review
i. the preliminary construction methodology.
j. utility diversion plans;
k. utilities protective works report;
l. traffic plans;
m. paving and reinstatement drawings;
n. geotechnical interpretation report (GIR);
o. geotechnical instrumentation plan (if any);
p. settlement analysis and protective works report (if required);
q. building protection drawings (if required);
r. civil and structural design statement;
s. structural analysis and calculations;
t. structural arrangement drawings for permanent and temporary works;
u. waterproofing drawings;
v. 3D BIM design models including 3D animation of construction methodology;
w. MEP design submission;
x. Fire and Life Safety report;
y. fire protection system submission;
z. water supply system;
aa. sanitary drainage system;
bb. station drainage system;
cc. combined services drawing (CSD);
dd. structural and rail systems (SRS) submission;
ee. stray current, earthing, bonding, and lightning protection plan;
ff. electromagnetic compatibility (EMC) control plan;
gg. equipment delivery and future replacement route drawings;
hh. architectural design report;
ii. architectural drawings.

5.15 Detailed Design Stage 2 {DS2 - Final}

5.15.1 In DS2 the Contractor shall consider and close out to the satisfaction of the Engineer all comments raised in the progressive design verification process.

5.15.2 Acceptance of the design shall be sought and secured from the relevant Authorities. The degree of design detail shall be adequate and sufficient for the Contractor's preparation of necessary construction, assembly, shop drawings, schedules for implementation of the Works.

5.15.3 DS2 submission shall comprise but not be limited to:

5.15.3.1 General

a. design status report;
b. standard details
c. structural arrangement drawings;
d. reinforced concrete detail drawings;
e. development interface report and drawings;
f. architectural drawings;

g. 3D BIM models;
h. animations;
i. maintenance strategy;
j. integrated energisation and system test plan;
k. architectural design report;
l. civil design statement;
m. alignment drawings;
n. Fire and Life Safety report;
o. **civil and structural design submission**:
    i. GIR;
    ii. instrumentation plan;
    iii. settlement analysis report;
    iv. building protection drawings;
    v. underpinning reports;
    vi. utilities drawings and subsidence report;
    vii. structural analysis and calculations;
    viii. structural detail drawings;
    ix. waterproofing drawings;
    x. paving and reinstatement drawings;
    xi. traffic diversion drawings;
    xii. contract material and workmanship specification;
    xiii. construction staging drawings;
p. station drainage submission;
q. CSD/SRS and SEM submission;
r. MEP submission;
s. earthing mat submission;
t. corrosion protection drawings;
u. MEP rail systems interface report;
v. the Contractor shall coordinate his designs with his interfacing parties and produce the respective interface control design documents;
w. earthing and bonding drawings and specifications;
x. sustainability report;
y. materials and workmanship specifications.

5.15.3.2 Good for Construction (GFC)

a. construction drawings, schedules and specifications;
b. manufacture, construction and installation drawings;
c. shop details, fabrication and assembly drawings.

5.15.3.3 As-built drawings and calculations shall comprise:

a. civil and architectural as-built drawings;
b. MEP works drawings;
c. Road works drawings;
d. detailed topographical survey;
e. submission of survey information
f. survey standards.

5.16 Design Submission Requirements

The Contractor's designs shall be fully coordinated with all Interfacing Parties, Project Partners and

relevant Stakeholders. The Contractor shall coordinate with all Stakeholders and shall be responsible for obtaining all the required approvals which relate to the submissions.

5.16.1 The Contractor shall develop and maintain detailed schematic drawings along with functional descriptions of all the systems that are part of the work under the Contract including their external interfaces.

5.16.2 Each design submittal, or groups of design submittals shall be accompanied by a design report which includes, without limitation:

a) the basic input parameters and assumptions used as the basis for the design;
b) the scope and purpose of the design submittal;
c) a brief high-level description of the design submittal written in plain English and how it relates to the overall work under the Contract, stating level of integration achieved and assumptions made;
d) design and check certificates.
e) All submissions shall be accompanied by two original copies of a 'Design Certificate' as set out in Attachment - D1 hereto and signed by the Contractor and the Designer
f) All the designs & drawings shall be proof checked by the proof consultant before submissions.

5.16.3 Each design submittal shall be supported, as appropriate, by:

a. functional descriptions;
b. system block diagrams;
c. drawings;
d. calculations;
e. catalogues;
f. samples.

5.17 Format of Calculations

5.17.1 Calculations relevant to all design submissions shall be submitted with the respective design submissions. Input used in computer analysis, with supporting explanation, shall be submitted to the Engineer for review of computer output on request.

5.17.2 If the design of the work under the Contract are revised and such revisions render the submitted calculations obsolete or inaccurate, the Contractor shall prepare and submit revised calculations.

5.17.3 Calculations including computer analysis and design shall be subdivided according to various disciplines and major structures. They shall be clearly and concisely compiled, cross referenced and indexed, and form a clear and comprehensive record of the design. They shall be clearly documented and referenced, and presented, after any photocopying reduction, in a readily legible format of minimum font size 10.

ATTACHMENT D 1

DESIGN CERTIFICATE

This design Certificate refers to design submission no .....which comprises of Definitive Design submission / GFC Drawings submission, working drawing submission scheduled in the attached transmittal, in respect of:

(Description of Permanent Works to which the submission refers)

DESIGNER'S STATEMENT:

We certify that:

a) The outline designs, design briefs and performance specifications of those elements of the Permanent works as illustrated and described in the documents scheduled in the attached transmittal, complies with the design basis criteria and other contract provisions.

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 the attached transmittal.

c) All necessary and required approval relating to the design of the Permanent Works, as illustrated and described in the documents listed in the attached transmittal, have been obtained.

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.

Signed by Designer's Authorized Representative Name :

Position :

Date :

CONTRACTOR'S CERTIFICATE:

The 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 and the design proposed by the designer has been accepted by us.

Signed by Contractor's authorized representative.

Name :

Position :

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.

SAMPLE DRAWING TEMPLATE

(a) Design Quality Assurance' by designer &contractor:

DESIGN QUALITY ASSURANCE			
The responsibility of control, Check and verification of accuracy, correctness, completeness, integration and full compliance of contract provisions in respect of design analysis and drawings rests with the design consultants and the contractor.			
By Designer			By Contractor
Sig:	Sig:	Sig:	Sig:
Date:	Date:	Date:	Date:
Name:	Name:	Name:	Name:
Designed By	Checked by	Approved by	Accepted by

(b) Notice of 'No Objection' from Engineer's representatives:

Notice of 'No Objections' from Engineer's			
	Remarks	**Date**	**Signature**
Chief Design Expert	Reviewed		
Deputy Project Director	Reviewed & comments as marked on drawing		
Project Director	Reviewed & No objection issued with comments as marked on Drawing		

[Contractor to attach copies of necessary and required approval for design.

5.18 BIM 3D and CAD Data

5.18.1 The Contractor shall comply with the Employer's Requirements and Technical Specifications for BIM and CAD Manuals.

5.18.2 Within 45 days of Commencement Date, the Contractor shall submit CAD and BIM Manuals, which shall be in compliance with the Employer's requirements.

5.18.3 The design shall be carried out on a common BIM 3D (shared information model in a common data environment) platform and shall be clash free.

5.18.4 For each of the Stations the Contractor shall provide, and update when requested by the Engineer, construction time sequencing in the model to permit time-lapse construction and walkthrough video to be prepared from commencement to completion.

5.18.5 Access to the 3D BIM model common platform shall be made available to the Engineer, and a monthly update, 3D BIM Model and PDF, shall be submitted by the Contractor to the Engineer.

5.19 Manufacture, Construction and installation

5.19.1 The Contractor shall not proceed with the manufacture, construction or installation of any work

contained within a design submission unless it has been approved by the Engineer.

5.20 Working (Shop) Drawings (Structural, MEP and Architectural)

5.20.1 For construction purposes the Contractor shall prepare working drawings, shop drawings and schedules. The working drawings shall correspond to the final design drawings, the final CSD, SEM, RCP and SRS drawings.

5.20.2 The Contractor shall provide samples and mock ups, including; piers, pier cross heads, electrical containment, pipe work, major architectural finishing elements (flooring, walling, glass, balustrades, doors, barriers etc.), as required by the Engineer, at least 28 days prior to the construction or fabrication of the part of work under the Contract to which they are related. The Contractor shall submit to the Engineer for approval a programme for the planned mock-ups within 90 days from the Commencement Date.

5.20.3 The structural reinforcement drawings together with the bar bending schedules shall be regarded as shop drawings. These drawings and schedules shall be certified by the Contractor.

5.21 As-Built Drawings and Calculations

5.21.1 The Contractor shall maintain contemporaneously all records necessary for the preparation of as-built drawings. As-built drawings shall be produced progressively as elements of the works are completed. As built drawings shall be verified and certified by the Designer.

5.21.2 The as-built drawings and models shall be endorsed by the Contractor as true records of the construction of the work under the Contract. One complete set of as-built drawings shall be submitted, in both hard copy and electronic formats, complete with calculations, to the Engineer.

5.22 As Built Survey

5.22.1 The Contractor at his own cost provide a detailed survey of the completed works, which shall include a topographical survey, locations of all piers, road realignment, finished deck levels.

5.22.2 Information Management. Information Management

5.23 General

5.23.1 The Contractor shall comply with the standards of the Employer's Project Management Information Systems (PMIS), in respect of information management.

5.23.2 The Contractor shall submit an Information Management Plan describing how the Contractor shall create, collect, store, search, manage and distribute information within 45 days of the Commencement Date for review by the Engineer.

5.23.3 The Information Management Plan shall:

a. include system architecture and process to describe how the Contractor will provide information to the Engineer in a controlled, efficient, transparent, auditable and timely manner;
b. contain information on workflow, metadata, Contractor's approval process and status;
c. be compatible with the Contractor's BIM/CAD/GIS/SMP and Engineering Content Management (ECM) Plan;
d. reference the Contractor's Electronic Document Management System (EDMS) document management plan;
e. detail how data and information will flow between the Contractor's BIM/CAD ECM environment to the Contractor's document control EDMS environment;
f. detail how assigned authority is controlled through workflows and permissions to ensure any sign-off function will only be presented to the correct authority; and
g. detail how object data from the BIM Model will populate areas in the Configuration Model.

5.24 Project Management Information System (PMIS)

5.24.1 The Contractor shall ensure data, metadata and information formats are compatible with formats required for PMIS reporting in accordance with Employer's Requirements.

5.25 Electronic Document Management System (EDMS)

5.25.1 The Contractor shall use an EDMS which is compatible with the Employer's web- based EDMS, to coordinate and control the document flow (create, process, storage, retrieval and distribution) of electronic and paper documents in a secure and efficient manner.

5.25.2 All the Contractor's Documents shall be controlled via the EDMS system for the work under the Contract.

5.25.3 These requirements cover all types of documents including, but not limited to:

a. management plans, procedures, method statements;
b. quality plan and documentation covering norms, standards quality control register etc.
c. design documentation covering preliminary and definitive designs, construction reference drawings, shop drawings etc.
d. design models;
e. mock-ups;
f. as-built drawings;
g. operation and maintenance manuals, safety manual, training manual
h. engineering calculations;
i. reports: - progress, investigation & survey, construction, test & commissioning, technical and non- technical;
j. time: programmes, schedules and cost;
k. certification documents for safety, technical clearance and opening of metro & Railway line for carriage of passengers.

5.25.4 The Contractor's EDMS shall;

a. provide a storage and backup infrastructure to prevent data loss and provide data recovery mechanisms;
b. provide a single, controlled source for each document;
c. provide an efficient search and retrieval of specific documents;
d. provide measures to control restricted access to program documents and provide access to all documents to all team members;
e. identify document development and approval processes that promote quality and consistency;
f. provide clarity regarding which version of a deliverable is the latest version;
g. provide a clear record of deliverables;
h. enable quick and direct propagation of changes;
i. provide an accurate and complete archive of documents to the Employer; and
j. Access of Contractor's EDMS to Employer and Engineer.

5.25.5 The Contractor shall submit an Electronic Document Management Plan within 60 days of Commencement Date for review by the Engineer, detailing how the Contractor shall implement and maintain a web-based EDMS. The Electronic Document Management Plan shall give an overview of the EDMS strategy and shall include a permissions matrix mapped to roles and responsibilities, workflow, systems architecture, resilience and disaster recovery.

5.26 Records

5.26.1 The Contractor shall ensure that records are kept and traceable to the material, equipment or services to which they relate. Those records shall include, but are not limited to:

a. calculations, specifications and drawings;

b. certificates verifying the characteristics and quality of the Goods;
c. tools and equipment calibration records;
d. surveillance, inspection and test results;
e. acceptances of processes, procedures and personnel for manufacturing, construction and installation;
f. non-conformance reports and corrective or preventive actions and their closeout;
g. specification waivers and concessions;
h. design review reports;
i. quality audit reports.

5.26.2 A record is any significant item of information received or created in the course of the Contract and maintained on any media for use at a later time.

5.26.3 The Contractor shall retain all records relating to the Works (including copies of all original documents delivered to the Engineer) for a period of five (5) years after the date of the last Performance Certificate issued for the Works, or for a longer period where required by applicable Laws.

5.26.4 Retention media can be hard copies, microfilm and/or electronic media. All records shall be stored in a storage facility suitable for the type of media being stored. All storage media shall be indexed and clearly labelled to identify the contents.

5.26.5 Records shall be stored electronically, unless otherwise required by applicable Laws.

5.26.6 Records shall be held in a suitable records storage facility until their destruction date. The storage facility shall meet the following minimum requirements:

a. the storage facility shall be constructed and maintained so as to prevent degradation or destruction of records by insects, rodents, weather conditions, fire, theft and deterioration by environmental conditions.

b. a system shall exist by which all of the Engineer's records are indexed (according to contents, organization, reference number, entry date and destruction date) so that they can be located within a reasonable time;
c. access to all records shall be controlled.

5.26.7 Complete reports of the inventory shall be provided by the Contractor when requested by the Engineer. A security system shall be maintained to preclude the entry of unauthorised personnel into the storage area and to guard against larceny and vandalism.

5.26.8 Equipment and software shall be available to read, view and print records in storage.

5.26.9 The Contractor shall notify the Engineer where the records are being held. The Engineer may perform a periodic audit check of the Contractor's storage facility to ensure all documents are being kept and stored correctly.

5.27 Document Submittal Register

5.27.1 The Contractor shall provide to the Engineer a document submittal register (DSR) of all contract deliverables within 30 days of the Commencement Date for approval by the Engineer.

5.27.2 The DSR shall be kept up to date by the Contractor and issued to the Engineer with the Contractor's monthly report and or as otherwise instructed by the Engineer.

5.28 Document Submissions

5.28.1 All correspondence reference numbers shall be generated in accordance with the Employer's File Naming Conventions and Metadata Requirements.

5.28.2 Copies of correspondence relevant to the execution of the work under the Contract and not of a confidential nature received from or despatched to government departments, utility undertakings, stakeholders and other contractors shall be submitted to the Engineer via EDMS for information as

soon as possible but in any case, not later than 7 days after receipt or despatch.

5.29 Electronic Submissions and Software to be provided

5.29.1 Design documents for Engineer review shall be submitted in digital format. Native formats of all final submissions shall be provided in addition to PDF copy.

5.29.2 Any commercial or proprietary software can be used for analysis and design provided the same is validated with manual computations or other standard software in multiple scenarios.

5.29.3 The Contractor shall provide and supply 2 (Two) certified licensed copy of the following Program management software.

a. Primavera P6 scheduling software.

5.29.4 The Contractor shall provide and supply to Employer/Engineer with a Certified licence 2 (Two) copies, including manuals and approved training of the software and subsequent versions thereof at no extra cost for any design (civil, MEP and Architecture) and native drawing software they use to the Engineer to allow review of the design. The Contractor shall provide and supply.

a. Drawing software (AutoCAD or similar)
b. BIM model software (Bentley Revit or similar) as defined in Employer's requirements
c. Asset management software (Maximo or similar) compatible with the 3D BIM software
d. Proprietary design (civil/structural, MEP and Architecture) software used for computation

5.29.5 The Contractor shall supply one certified copy of the software they use for Interface and Requirements Management.

6 Stakeholder and Communication Management

6.1 Stakeholder and Communication Management Plan {SCMP}

6.1.1 Within 45 days of the Commencement Date, the Contractor shall submit to the Engineer for review an SCMP.

6.1.2 The Contractor shall include all stakeholders as part of the SCMP.

The SCMP shall define the engagement of all external stakeholders, including the authorities required to participate in the review, approval and issue of design and construction permits, as well as the residents, business and developers affected by the work under the Contract. The external stakeholders shall include but not limited to:

a. Statutory Authorities;
b. Utility Owning Agencies;
c. Public Service Providers;
d. Developers; and
e. Resident Welfare Associations, Non-Governmental Organisations (NGO), Industry Associations, etc.

6.1.3 The SCMP shall include a communications matrix and details of distribution methods and responsibilities.

6.1.4 The Contractor shall submit a monthly status update of all stakeholder communications and agreements.

6.2 External Communications

6.2.1 The Contractor shall not issue or verbally disclose any information, publication, document or article for publication in any media, print or digital, without prior approval of the Engineer, who may place conditions on its approval.

The official language of formal communications is English, excepting for communication in Kannada with government bodies, as necessary.

7 Construction, Manufacturing, installation and Logistics

7.1 Method Statements

7.1.1 The Contractor shall submit to the Engineer for review comprehensive method statements for all planned construction activities.

7.1.2 Method statements shall be submitted a minimum of 30 days in advance of the work commencing to allow for adequate time for Engineer review and resubmission as necessary and further review.

7.1.3 Prior to any activity for which a method statement is required, the Contractor shall have obtained the Engineer's approval to its method statements for such activity.

7.1.4 Prior to the commencement of all major work elements the Contractor shall call a Readiness Review to brief the Contractors and Engineers site construction teams on the construction methodology.

7.1.5 The method statements shall clearly identify the Contractor's proposed methods and sequence of working, including programme details and shall include but not be limited to:

a. personnel;
b. method and sequence of the work;
c. proposed methods of temporary support where required to ensure the safety of the work under the Contract, addressing prevention of deterioration of the excavation due to exposure;
d. programme for the work;
e. traffic diversion schemes;
f. a comprehensive construction risk assessment report prior to the commencement of the construction work under the Contract and detailed Work Specific construction risk assessment reports prior to the commencement of particular elements of the work under the Contract;
g. proposals for protection of adjacent structures and ground treatment where appropriate;
h. instrumentation for monitoring the work, particularly monitoring of adjacent structures, utilities and adjacent ground where appropriate;
i. locations and method of stockpiling excavated fill material where appropriate;
j. reinstatement work inclusive of road works, drains, box culverts, and ancillary structures where appropriate;
k. noise and vibration monitoring, including attenuation proposals where necessary;
l. methods for the collection, storage and disposal of all waste, including procedures for safe handling, storage and disposal of toxic waste;
m. identification of checks to be carried out, details of the QA/QC records that will be submitted to the Engineer;
n. a staff supervision/responsibility matrix for the various elements of the work.

7.2 Survey

7.2.1 Before the Contractor commences the setting out of the Works, the Engineer will provide reference drawings showing the position of survey points and benchmarks, together with the co-ordinates and/or level assigned to each point, that were used in developing the Employer's Reference Drawings, which have been provided for information only. The Contractor shall comply with GC Clause 4.7 and verify the accuracy of the information.

7.2.2 The Contractor shall design the Works to comply with vertical and horizontal clearances confirmed in Employer's requirements.

In case of any differences from the Employer's drawings or data, the Contractor shall bring these to the notice of the Engineer immediately and submit his proposals for correction/modification of the alignment. The Contractor shall satisfy himself that there are no further conflicts between the data given and the survey control/reference points & benchmarks established by him and all the conflicts (including with the survey data of adjacent Contractors) shall have to be satisfactorily resolved by this

contractor. All such proposals for correction prepared by the Contractor and all such rectifications work undertaken by the Contractor to resolve / eliminate all such differences / discrepancies / conflicts in survey data of the Employer / adjacent contractor and the Contractor shall not entitle for any claims or extension of time. All the necessary works in this regard shall be done by the Contractor without any cost or time implications to the Employer.

7.2.3 The Contractor shall establish and provide all subsidiary setting out points, monuments, towers and the like which may be necessary for the proper and accurate setting out and checking of the Works.

7.2.4 The Contractor shall carefully protect all the survey reference points, benchmarks, setting out points, monuments, towers and the like from any damages and shall maintain them and promptly repair or replace any points damaged from any causes whatsoever.

7.2.5 The setting up of the accurate survey reference points and maintaining them shall be the full responsibility of the Contractor. The Contractor shall check the survey reference points every three months to ensure that these survey points continue consistent with the benchmarks.

7.2.6 All levels given on the Contractor's Documents shall refer to a project height datum, which shall be confirmed by the Engineer. The project height datum shall be clearly defined and indicated on the design drawings.

7.2.7 All coordinates given on the Contractor's Documents shall be based on the project coordinate system, which will be confirmed by the Engineer. The project coordinate system shall be clearly defined and indicated on the design drawings.

7.2.8 The Contractor shall relate the construction of the work under the Contract to the coordinate system and height datum.

7.2.9 The Contractor shall maintain a common survey interface with adjacent Work Packages, and shall make available accurate survey information for setting out subsequent work under the Contract by other Project Partners.

7.2.10 The Contractor shall be wholly responsible for the setting out of the Works, and certify it is in full compliance with the Employer's requirements and their Design. The Contractor shall have a third party check the setting out of the Works to ensure at handover the alignment is compliant with the Employer's requirements.

7.2.11 Prior to handover to Project Partners the Contractor shall carry out a wriggle joint survey along with Engineer to confirm clearances are in compliance with the Project Schedule of Dimensions. The Contractor shall provide a Clearance Report which shall be endorsed by Project Partners as applicable.

7.3 Contractor's Equipment

7.3.1 All Contractor's Equipment used on the Works shall be less than five (5) years old at the commencement of the Contract. If the Contractor proposes to use any equipment older than five years old, they shall first seek the approval of the Engineer/Employer before mobilisation on site.

7.3.2 All Contractor's Equipment used on the Works shall have a valid certificate of operation provided by a recognised licensing authority.

7.3.3 Contractor Equipment operators shall hold a valid appropriate operator licence.

7.4 Removal of Temporary Works and Facilities

7.4.1 On the issuance of the Taking-Over Certificate, or earlier if directed by the Engineer, the Contractor shall remove all Temporary Works and facilities and reinstate the Works to the original existing conditions to the satisfaction of the Engineer.

7.4.2 Reinstatement means replacement to match the original condition unless otherwise stated. The Contractor shall also remedy any defect caused by the Contractor during the course of the work under the Contract.

7.5 Temporary Traffic Management

7.5.1 The Contractor shall provide all necessary expertise to plan, design, implement, operate and maintain a temporary traffic control in accordance with the requirements of all relevant Laws and the Employer's requirements.

7.5.2 A comprehensive temporary traffic management scheme shall be installed and operated by the Contractor to facilitate the construction of the work under the Contract. Temporary traffic management schemes shall ensure that minimum disruption is imposed on the traffic in the vicinity of the work under the Contract and ensure safe and efficient management of traffic for all work conditions and at all stages of construction.

7.5.3 The Contractor shall produce detailed temporary traffic management schemes to suit their method and sequence of work for approval by the relevant statutory authorities.

7.5.4 The Contractor shall prepare a complete traffic management scheme for the work under the Contract that considers any wider impact of modifications to the existing road network. This will include an advance traffic signals & signing strategy, forewarning drivers of construction works and associated diversions.

7.5.5 The Contractor shall undertake traffic surveys on roads affected by the traffic diversions, in particular at junctions currently experiencing high demand or operating close to capacity, both prior to undertaking the diversion to establish a baseline, and following a settling-in period of the new diversion. These shall be used to monitor the traffic impact of the work under the Contract. All temporary diversions shall be maintained by the contractor.

7.6 Demolition of Structures

7.6.1 The Contractor shall demolish and dispose of all resultant demolition materials for all structures including buildings, drains or any other structures, to facilitate the construction of the work under the Contract.

7.6.2 The Contractor shall backfill any part of the void created with suitable material and reinstate the area to match with the surrounding ground level.

7.7 Disposal of Excavated and Contaminated Materials

7.7.1 The Contractor shall carry out regular testing to confirm the classification of materials to be disposed. The laboratory at which the testing is to be carried out shall be subject to the review of the Engineer. Prior to taking any sample for testing, the Contractor shall obtain the Engineer's agreement that the sample is representative of the material to be disposed.

7.7.2 The Contractor shall submit to the Engineer for approval an Excavated and Contaminated Materials Disposal Plan within 60 days of Commencement.

7.7.3 Where excavated soil or imported fill fail to meet the requirements for fill material only because of excessive moisture content, the Contractor shall dry it so that it meets the requirements for fill material.

7.7.4 The Contractor may propose and implement methods to treat waste to render it acceptable as fill material acceptable.

7.7.5 The Contractor shall ensure that materials in each of the defined categories are segregated during excavation and kept so thereafter. Where materials from different categories are mixed together the resulting mixture shall be considered as waste.

7.7.6 The disposal of waste and contaminated material shall be entirely the responsibility of the Contractor.

7.7.7 The Contractor shall maintain a record of all materials disposed of the Site.

7.7.8 The Engineer shall have access to these records at any time and may instruct the Contractor to obtain, at the Contractor's cost, independent verification of the size of loads carried by any or each vehicle.

7.7.9 If the Contractor identifies contaminated material a specific disposal plan shall be submitted to the

Engineer for review. Excavation works of any works leading to the production of contaminated excavated material for disposal shall not proceed until a successfully reviewed plan is in place.

a. The plan shall include the Contractor's proposals for additional and ongoing environmental sampling and testing, including the programme of sampling and details of the testing facility.
b. The plan shall outline procedures for action in the event that contaminated material is encountered. These shall include all health and safety aspects and materials handling and transportation.

7.7.10 The Contractor shall submit to the Engineer for review their proposed method of disposal of any bentonite slurry waste and bentonite contaminated excavated material, including the methods of transporting bentonite slurry waste and bentonite contaminated excavated material on public roads.

7.7.11 A Mechanical Type Washing Plant shall be installed by the Contractor for use of all Vehicles leaving the Casting Yard or any other work area of the Contractor to avoid any spillage on any connecting roads. The Contractors shall ensure any material spillage deposited on roads is immediately removed so as to minimise impact on the public and other road users.

7.7.12 All incoming and outgoing haulage trucks used to move material shall have sealed tailgates and a cover to prevent dust and debris escaping.

7.8 Restoration of Areas Disturbed by Construction

Any areas disturbed by the construction activity, either inside or outside the Project Right of Way or Site Areas, shall be reinstated by the Contractor to their original condition, or better, with new materials. These shall include but not necessarily limited to sidewalks, parking lots, access roads, adjacent roads, adjacent properties and landscaping. Grass cover shall be provided for any bare earth surface areas, along with proper provision for surface drainage.

7.9 Manufacturing

7.9.1 Management

The Contractor shall establish procedures and controls that govern the procurement, integration, manufacture and testing, quality assurance and delivery of plant, equipment and spares to be supplied under the Contract. This shall include the administration and supply of spare parts and warranty in accordance with the Contract. The Contractor's Manufacturing Management Plan shall be submitted to the Engineer for an approval within 45 days of the Commencement Date.

7.9.2 Procurement and Subcontract Management

The Contractor's management system and procedures shall establish and employ a procedure for materials procurement and Sub-contracting, sufficient to assure technical, administrative, quality and contractual controls consistent with those of this Contract. The Contractor's management system shall be auditable for materials sources, lot number, serialised equipment, etc. Sub-contract amendments shall be employed whenever contractual changes are made either bilaterally or unilaterally by the parties involved. Prior approval of the Engineer shall be taken for the make of all equipment and accessories.

7.9.3 Manufacturing and Production Management

The Contractor's manufacturing and production management system shall encompass all points of receiving, raw material and components processing, fabrication, assembly, test and all points of in-process inspections. The Contractor's Manufacturing Management Plan shall contain:

a. a brief description of all inspection hold points and test points, and a correlation with the programme schedule;
b. a list of all Sub Contractors; and
c. a delivery schedule of each item of equipment to match installation plan, together with Manufacturer's Qualification: The equipment manufacturer shall show at least ten year of

continuous and current experience in the design, assembly, and testing of similar equipment as being offered complying with the Contract Specifications.

7.10 Equipment installation

7.10.1 **Equipment installation Plan and Programme**

The Equipment Installation Plan shall confirm how the Contractor proposes to organise and carry out the installation and complete the whole of the Works by the given Key Dates.

The Contractor shall submit the Plan for approval to the Engineer 90 days prior to the start of installation on site the Contractor shall attend weekly planning meetings with the Engineer to finalise the Work detail, commencing 4 weeks prior to the start of installation on site.

The complete installation is to be carried out as per Coordinated installation Programme (CIP) agreed by all interfacing Contractors and approved by the Engineer.

7.10.2 **Contractors' Resident Staff**

The Contractor shall ensure that a qualified representative of the manufacturer is available on-site for the duration of the on-site Works during normal working hours and installation period and on-call to arrive on site within 30 minutes at all other times. The manufacturer's representative shall support the Contractor's Representative during the installation and Testing phase of the Works. The Contractor's Representative shall have sufficient authority to progress the Contractor's work on Site. The Contractor's Representative shall be competent and qualified to act on behalf of the Contractor, and Provide upon request information that may include:

a. Current progress of the Works;
b. Planned work for the next 5 weeks;
c. Audit and inspections reports;
d. Health and safety information; and
e. Documents and records pertaining to the Works

7.11 Storage, Shipping and Delivery

7.11.1 The Contractor shall provide and maintain acceptable storage facilities for the Contractor's Equipment, temporary works, Employer's equipment, plant, materials and any other things intended to form or forming part of the work under the Contract.

7.11.2 The Contractor shall prepare, protect and store all Contractor's Equipment, temporary works, Employer's equipment, plant, materials and any other things intended to form or forming part of the work under the Contract. This shall act 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.

7.11.3 The Contractor shall notify the Engineer 14 days in advance of any expected shipment date and give further notification of the actual shipment date and routing when such information is subsequently established. This shall complement the inspection requirements prior to delivery as specified herein.

7.11.4 Packing lists and quality certificates for all materials and equipment shall be issued monthly to the Engineer as part of the Quality Register.

7.11.5 Any part of the goods to be supplied under the Contract which is damaged in transit shall not be considered as delivered until repairs or replacements have been made and all necessary spare parts or items have been delivered to the Site.

7.11.6 The Contractor shall remove temporary fittings required for shipment and re- assembly of equipment and shall complete this prior to the equipment or parts thereof being inspected and before they are considered delivered.

7.11.7 An item shall be considered delivered when all damage has been repaired and all documentation and

post-delivery preparation have been completed to the satisfaction of the Engineer.

7.12 Logistics

7.12.1 The construction involves extensive works and to prevent major traffic congestion, construction vehicle movement shall be reduced to a minimum.

7.12.2 The Contractors' responsibilities shall include development of a detailed logistics plan, processes and procedures for the Project:

a. Provision of information related to the transport of all plant, materials, equipment, goods, and labour to the Employer and to relevant stakeholders and Authorities to assist with coordination; and

b. Acquisition of all permits and approvals from the relevant stakeholders and authorities required for the transport of all items related to construction including material sourcing, storage, manufacture, treatment and disposal.

7.13 Key Materials Stocks and Supplies

7.13.1 Buffer Stocks

7.13.1.1 In order to minimize the risk of key material shortages during execution of the Works, the Contractor shall maintain, either on-site or off-site, a minimum of two-month rolling buffer stock of the following key materials:

a. Cement – for incorporation in cast in situ and/or precast concrete;

b. Aggregates – for incorporation in cast in situ and/or precast concrete;

c. Reinforcement Steel - for incorporation in cast in situ and/or precast concrete;

d. Stressing tendons and fixings.

7.13.1.2 For the purposes of monitoring of the Contractor's compliance with the rolling buffer stock requirement, the Contractor shall supply a supplementary program. This shall be updated and aligned with the Contractor's Programme. It shall also include but not be limited to the key raw materials.

7.13.1.3 The Contractor shall provide monthly reports to the Engineer, which confirms compliance with the Employer's rolling buffer stock requirement.

7.13.1.4 All costs associated with the material storage in the buffer stock, including but not limited to any transportation costs, shall be borne solely by the Contractor. Maintenance of the material buffer stocks includes, but is not limited to, protection of stockpiles from weather conditions, stockpile management processes, procedures, and storage facility plant and equipment.

7.13.1.5 Any request by the Contractor for approval of key materials from international markets shall contain in minimum the following:

a. proof that the local markets are unable to meet the required demands;

b. method for utilising internationally sourced key materials in supplementing key materials supply from the local market;

c. assurance of internationally sourced key material compliance and compatibility with local market key materials, particularly related to effects and impacts on blended materials / products properties for consistency and conformance.

8 Site Management

8.1 Access to the Site

8.1.1 The Contractor shall be given access to the Site in accordance with the Contract. On taking access the Contractor shall inspect the Right of Way and take a photographic survey confirming the condition which shall be submitted to the Engineer/Employer.

8.1.2 Entry to and exit from the Site shall be controlled by the Contractor.

8.1.3 The Contractor shall ensure that access to every portion of the Site which is in its possession or to which it has access is continuously available to the Employer and Engineer.

8.1.4 The Contractor shall be responsible for ensuring that any access or egress to the Works is controlled so that there is no disturbance to members of the public or damage to public or private property occurs as a result of the use of such access or egress.

8.1.5 The Contractor shall provide a means of distributing loads imposed by Contractor's Equipment and traffic and prevent damage to roads and utilities.

8.1.6 The Contractor shall maintain access to all roads and side roads within the Site throughout the Works. Access to all existing buildings, car parks and other accesses shall be similarly maintained.

8.1.7 Existing pedestrian routings and road crossings, and their existing widths, shall be maintained at all times.

8.2 Site installation

8.2.1 The following particulars shall be submitted to the Engineer for approval not more than 30 days after the Commencement Date:

a. Drawings showing the formation works and the layout at all sites for the Contractor's offices, project signboards, principal access and other major facilities required, together with all service utilities.

b. Drawings showing the details to be included on the project signboards and diversion boards.

c. The Contractor shall submit to the Engineer for review a plan of intended use of the Works areas and the layout of each proposed Site facility.

8.2.2 Drawings showing locations of stores, storage areas, concrete batching, Contractor's Equipment and other major facilities and their access roads/paths shall be submitted to the Engineer for his review as early as possible, but in any case, not less than 30 days prior to when such facilities are intended to be constructed on the Site.

8.2.3 The Contractor shall be responsible for forming the Works areas, constructing all temporary access roads, services including water and power supply for the Works, and drainage and for maintaining the Works areas. All Temporary Work used in the construction of the temporary facilities or Permanent Works shall be such that they can be easily removed before Taking Over of the Works.

8.2.4 Road works, sewer and drainage work and utilities diversions required may extend beyond the Contract limits. Requirements of other relevant authorities shall be deemed to be included in the Works.

8.2.5 The use of ground anchors shall be avoided as far as possible. For any ground anchors or other Temporary Work used in the Works that encroach beyond the Works areas boundary, the Contractor shall seek the permission of and satisfy all requirements of the relevant statutory authorities and stakeholders.

8.2.6 The Contractor shall take note that the Works areas shown on the drawings are indicative and approximate. The actual extent of such areas and the layout of the Contractor's facilities shall be agreed and confirmed with the Engineer through Site surveys conducted by the Contractor before taking possession of the Site. The Engineer reserves the right to adjust the boundary of these areas to suit Site conditions.

8.2.7 The Contractor may also use Works areas for storage of construction materials subject to obtaining all necessary approvals. The Contractor shall take all necessary safety precautions to ensure that such activities do not pose a hazard. Barriers and signage shall be erected by the Contractor to serve as proper demarcation and warning.

8.2.8 Where the Works area is not served by an access road, the Contractor shall construct access roads as required. The Contractor shall survey the Site and propose the road alignment for the Engineer's review prior to its construction. Complete details of access roads and the integration with the existing

or temporary traffic management system shall be submitted to the relevant authorities for approval prior to commencing the Works.

8.2.9 If additional Works areas are necessary, the Contractor shall be responsible for seeking, at his own cost, any additional Works areas that may be required.

8.3 Site Conditions, Maintenance and Clearance

8.3.1 All Temporary Works which are not to remain on the Site after the Completion of the Works shall be removed prior to Completion of the Works or at other times instructed by the Engineer. The Site shall be cleared and reinstated to the lines and levels and to the same or better condition as existed before the Works started except as otherwise stated in the Contract.

8.3.2 Housekeeping is a basic requirement and good housekeeping shall be maintained at all times. The Contractor's responsibility for good housekeeping shall include, but is not limited to:

a. the wheels of all Site vehicles shall be washed before leaving Site to avoid depositing mud and debris on the adjacent roads; and

b. the Contractor shall ensure all roads adjacent to the Site entry gates are kept clean and free from any mud or debris from the Works.

8.3.3 Prior to taking over of the Works or any Section, the Contractor shall undertake full clearance of all rubbish and waste and full cleaning of all of the parts of the Works.

8.3.4 The Contractor shall provide latrines and wash places for the use of Contractor's Personnel and all other persons who will be on the Site. The size of latrines and wash places shall accord with the numbers of persons entitled to be on the Site, which may necessitate their location on structures. Where necessary there shall be separate facilities for males and females. The capacities and layout shall be subject to review by the Engineer. The Contractor shall arrange regular disposal of effluent and sludge in a manner that shall be in accordance with local laws/regulations.

8.3.5 The Contractor shall be responsible for maintaining all latrines and wash places on the Site in a clean and sanitary condition, ensuring that they do not pose a nuisance or a health threat. The Contractor shall also take steps and provisions as deemed necessary or as directed by the Engineer to ensure that vermin, etc. are controlled at all times.

8.4 Site Utilities

8.4.1 The Contractor shall be responsible for providing water, electricity, telephone, sewerage and drainage facilities for the Engineer's Site offices, Contractor's Site offices, structures and buildings and for all Site laboratories and all such services that are necessary for satisfactory performance of the Works. The Contractor shall make all arrangements with and obtain the necessary approval from the relevant civil and utility authorities for the facilities.

8.4.2 The Contractor shall meet the requirements for the supply and provision of power and water services for all Interfacing Parties which shall be on a chargeable basis.

8.4.3 The Contractor shall be responsible for power provision on the Site during Construction.

8.5 Site Traffic Management and Transport Safety

8.5.1 Traffic Management Plan

The Contractor shall develop a detailed Traffic Management Plan for the work under the contract. This Traffic Management Plan shall be submitted within 45 days from the Commencement Date. The purpose is to develop a Traffic Management Plan to cope with the traffic disruption as a result of construction activities by identifying strategies for traffic management on the roads and neighbourhoods impacted by the construction activities. The Contractor shall implement the Traffic Management Plan throughout the whole period of the Contract.

8.5.2 The basis for the Plan shall take into consideration four principles:

a. To minimize the inconvenience of road users and the interruption to surface traffic through the area impacted by the construction activities;
b. To ensure the safety of road users in the impacted area;
c. To facilitate access to the construction site, and to maintain reasonable construction Progress; and
d. To ensure traffic safety at each construction site.

The Contractors Traffic Management Plan shall confirm the arrangements to be made for accommodating road and pedestrian traffic at individual construction sites and continuously along the alignment, for smooth traffic operations and for the safety of both construction workers and road users. The Plan shall consider different measures such as:

a. Proper phasing and timing of traffic signals;
b. Modifications to inter section geometry;
c. Changes in lane usage;
d. Parking prohibitions;
e. re-location of bus stops;
f. reducing width of foot paths and median
g. right-turn prohibition;
h. work site access management;
i. Minimizing the duration of any road closure;
j. reversible lane operations;
k. Modification of roadway alignment affected by the construction, which shall be in conformance with the requirements and regulations defined by the relevant authorities; and may include widening of roads, Construction of temporarily new road etc.;
l. Other traffic engineering measures as may be applicable.

8.5.3 The Contractor shall manage the vehicular and pedestrian right of way during the period of construction. The Contractor shall include local traffic diversion routes and assess traffic impacts caused by the construction in the affected areas. Signage layout shall be included to ensure that adequate motorist information will be provided for traffic diversions. Where it becomes necessary to close a road or inter section, or supplementary lanes are required to satisfy the traffic demands, traffic diversion schemes to adjacent roadways shall be developed with quantitative justifications. The Contractor shall co-ordinate with all relevant authorities.

8.5.4 The Contractor shall be responsible for all on-Site traffic management. Vehicular routes shall be segregated from pedestrian traffic wherever possible and clearly marked.

8.5.5 The Contractor shall be responsible for provision of access to emergency services including but not limited to police, fire services, ambulance, civil defence and other authorities.

8.6 Contractors Responsibilities

8.6.1 The Contractor shall restrict his workforce from entering the Site(s) of other Contractors in and around the vicinity of the Works and taking all necessary precautions to prevent any trespassing and damage arising from nuisance of any kind.

8.6.2 The Contractor shall confine the work activities including storage of construction materials, movement and packing of equipment, machinery and plant within the allocated Works areas.

8.6.3 The Contractor shall execute his work in such a manner as to cause minimum inconvenience to the public and other contractors.

8.6.4 The Contractor shall control its workforce and those of the Subcontractors to ensure that workers do not loiter in public areas or facilities and do not intimidate local residents.

8.6.5 The Contractor shall make suitable provisions for and shall control vehicles to the Works areas. This shall ensure that roads are not blocked and there is no disturbance to the community.

8.6.6 The Contractor shall:

a. confine his use of the areas of the Site for purposes reviewed by the Engineer who reserves the right to extend, amend or restrict the uses to which areas of the Site will be put;

b. refrain from depositing rubbish or causing nuisance or permitting nuisance to be caused and except where reviewed by the Engineer, depositing earth on or removing earth from areas of the Site;

c. on issuance of the Taking-Over Certificate, or earlier if directed by the Engineer, remove all Temporary Works except where permitted and reinstate the areas of the Site to the extent, standards and details indicated in the Contract or as proposed by the Contractor and reviewed by the Engineer;

d. refrain from obstructing manholes, utility access points and the like;

e. refrain from felling trees, refrain from depositing earth around the trunks of trees and protect all trees remaining on Site.

8.6.7 Work other than that necessary for completion of the Works shall not be carried out on Site.

8.6.8 Unless otherwise stated, the Contractor shall pay all rates and charges of any nature whatsoever arising out of his use of the Site and all Works areas provided therein under the Contract.

8.7 Services and Facilities for the Employer and Engineer

8.7.1 The Contractor shall provide all facilities and the services for such facilities for the exclusive use of the Employer, Engineer and any other parties directed by the Employer, on the Site or at other locations very near to the work area agreed with and to the satisfaction of the Engineer as per **Appendix-VI** of Employer's Requirements.

8.7.2 **Engineer Offices**

The specifications, equipment and other requirements of Project offices & Site offices are given in detail in Appendix-06.

NOTE: All the requirements of offices, furnishings, equipment, appliances, tools, maintenance standards, personnel – including their qualifications and expertise, are designed for effective execution and close monitoring of the progress and quality of work.

a) The Employer/Engineer Office shall be located no further than 50m walking distance, from the Contractor's Project Office.

b) The Contractor shall provide a minimum temperature and humidity controlled (air-conditioned) Engineer office as shown in the table below, which shall, except otherwise stated, be fully fitted, furnished and equipped. The purpose of the offices is to provide adequate office accommodation for those members of the Engineer's personnel involved in the daily inspection and examination of the work under the Contract and the auditing of the Contractor's activities.

c) The offices shall include a fully equipped kitchens complying with regulatory requirements, suitable for the preparation of hot and cold food and drinks relevant to the intended number of occupants. The kitchen will as a minimum be provided with a refrigerator/freezer of minimum 500 litre capacity, a microwave, water boiling equipment, dishwashing facilities etc.

d) Toilet facilities shall comply with regulatory requirements and as a minimum shall comprise separate male and female toilets on the basis of a male to female ratio of 9:1. Both male and female toilet facilities shall have a minimum of one shower unit, and the Contractor shall provide a changing area and clothes lockers.

e) A room with seating is to be provided for drivers.

f) The Contractor shall provide the main Contract office with 24-hour security services.

g) All office facilities shall have electronically controlled access cards (RFID) & biometric entry.

h) Deleted

8.7.3 Deleted

8.7.4 **Services**

The Contractor shall provide services to all offices and buildings provided for the use of the Employer and the Engineer. The services shall include signage, maintained access roads, allocated covered car parking spaces, standard 240V voltage electricity, lighting, telephone lines, internet connections, air conditioning and heating, water supply, sewage disposal and waste disposal, fire detection/alarm system and the like.

8.7.5 The building(s) shall be cleaned daily and shall regularly maintained with 365/24/7 working. Sanitary facilities shall be regularly supplied with consumables such as, but not limited to, lavatory paper, disinfectant, soap, detergent and paper towels.

8.7.6 Signage shall clearly identify the offices and building(s). The size, colours and style to be adopted shall be agreed with the Engineer. Schematic plans shall be used to orientate visitors.

8.8 Office Equipment and Services for the Engineer

8.8.1 The Contractor shall maintain all equipment and provide all required consumables (ink, cartridges, toner, paper, etc.) throughout the whole duration of the Contract.

8.8.2 The Contractor shall provide telephone services which shall be restricted to national calls (within India) only, except for the Engineer's room which shall have international call facility, and the Contractor will pay the related telephone bills.

8.8.3 The Contractor shall provide high speed internet connection to support the facilities and pay both the Internet Service Provider fees and the user costs for internet connections.

8.8.4 Water cooler with RO filter for potable water and two water fountains including a supply of potable water bottled by a reputable and registered water supplier.

8.8.5 The Contractor shall provide all electrical power required for Employer's and Engineer's facilities and pay all electrical bills.

8.8.6 The Employer's offices, equipment therein, consumables, maintenance and security services shall be provided for the whole period of the Works (including the Defects Liability Period), at which time the Offices and all furniture and fittings therein shall revert to the Contractor and the sites thereof shall be reinstated by the Contractor. All moveable equipment detailed and any other equipment provided by the Contractor under an Instructed Variation Order, shall be handed over to the Employer.

9 Interface Management

9.1 Interfaces

9.1.1 The Contractor, in the delivery of the work under the Contract, shall coordinate the work under the Contract with the works of project Interfacing Parties and with external stakeholders who are affected by the Works. Such interfacing and coordination activities require the implementation of interface management techniques to efficiently manage interfaces that can be either design or construction related.

9.1.2 An outline Project Interface Matrix and Interface Requirements are listed in Appendix XIII for the guidance of the Contractor.

9.2 Interfacing Parties

9.2.1 "Interfacing Parties" or "Project Partner" shall be defined as:

Any Authority, other contractor employed by the Employer on the Project, consultants performing design services on the Project (such as but not limited to adjacent civil works contractors, station contractors, system-wide contractors, track work contractors, depot contractors and rolling stock suppliers), or in the case of the Employer, only to the extent of any Project contract not yet awarded

to another contractor or consultant employed by the Employer; who interface with the Contractor in the execution of the work under the Contract.

9.2.2 The Contractor shall be responsible for his work on the Site and shall coordinate all activities {design and construction} with those activities of other contractors on the project, to the extent specified in the Employer's Requirements or as required by the Engineer from time to time.

9.2.3 The Contractor shall provide a fully coordinated and interfaced design for the Works.

9.2.4 The Contractor shall, as specified in the Contract or as instructed by the Engineer, allow appropriate opportunities for carrying out work to:

a. the Employer's Personnel and the personnel of any Authority;
b. Interfacing Parties;
c. Stakeholders;

who may be engaged in executing, on or near the Site, or elsewhere in the Project work not included in the Contract.

9.3 Interface Management Plan

9.3.1 Within 45 days of the Commencement Date the Contractor shall submit for the Engineer's approval, an Interface Management Plan (IMP) that will describe how the Contractor will develop and maintain the IMP throughout the Time for Completion of the Works.

9.3.2 The IMP will identify as a minimum:

a. the Contractor's organisation responsible for Interface Management;
b. the roles and responsibilities of the individuals performing interface management;
c. the interface coordination processes and procedures to be implemented that will ensure design and construction interfaces are identified, managed, controlled and validated throughout the delivery of the Works.

9.3.3 The Contractor shall produce the following working documents that will form part of the Interface Management Plan (IMP):

a. The IMPP (see Clause 12.4);
b. Responsibility of the Contractor;
c. Interface Management System;
d. Responsibility Interface Matrix and Interface Sheets;
e. Interface Register;
f. Coordinated Design Interface Programme;
g. Design control interface documents.

The IMP shall conform with the Employer's Requirements.

9.4 Interface Management Plan & Programme (IMPP)

9.4.1 The IMPP will be submitted by the Contractor to describe the sequencing and timing of each of the Interfacing Contractors' scope of work, clearly describing the interdependencies for all stages of the work between the Contractor's work and that of the Interfacing Contractors and complementing the Interface Management Plan, whilst complying with all Key Dates stated in the tender document.

9.4.2 The IMPP shall be structured to detail each of the primary zones of interface and the principal elements of the design and of the works requiring interfacing contribution from others. This IMPP shall also be related to the Contractor's Works Programme and shall show the sequences and timing agreed with the Interfacing Contractors to the necessary degree of detail to clearly illustrate each of the interfaces to be undertaken.

9.4.3 Targets to receive or supply information shall also be shown, with due allowance being given for the design process of others. Information relating to Contractual Key Dates and information exchanges dates shall be shown for both the Contractor and the Interfacing Contractors to demonstrate a

matching of design processes. A record of these interfaces, with current status and agreed dates for information transfer, site inspections, access, occupation, handover, etc. shall be maintained.

9.4.4 The Interface Management Plan &Programme (IMPP) shall be a process driven programme in a format to be agreed with the Engineer. The IMPP shall incorporate the Key activities from both the Interfacing Contractor's and Contractor's Works programmes that will enable the Contractor to demonstrate that any Interface is being correctly managed and will result in fully co-ordinated design/construction/ installation of works.

9.5 Responsibilities of the Contractor

9.5.1 The Contractor shall take all necessary steps to ensure that the work under the Contract is coordinated and integrated with the works of the Interfacing Parties and shall comply with any directions which the Engineer may give for the integration and/or coordination of the work under the Contract with the work of the Interfacing Parties.

9.5.2 The Contractor shall adopt a proactive approach in seeking out interface issues and their solutions and shall identify the Interfacing Parties and their related requirements.

9.5.3 The Contractor shall communicate, coordinate and exchange information directly with Interfacing Parties. Information necessary to fulfil the Contractor's interface obligations shall be directly requested and obtained from the Interfacing Parties, and receipt acknowledged. Conversely, the Contractor shall provide directly to the Interfacing Parties information within the Contractor's scope that is required by them.

9.5.4 By exception, the Contractor shall provide the Engineer in writing with details of any issues of significance encountered in obtaining necessary information and or lack of cooperation from any Interfacing Party. The Engineer will review the matter and direct the Contractor and the Interfacing Party or Parties as to the required action.

9.5.5 The Contractor shall provide all information reasonably required by the stakeholders in a timely and professional manner to allow them to proceed with their design and construction activities.

9.6 Interface Management System

9.6.1 The Contractor shall develop an Interface Management System {IMS} in close coordination with the Engineer and shall offer the use of proven interface management processes and tools suitable for a railway infrastructure program of the size and complexity of the project.

9.6.2 The Contractor shall establish and maintain the IMS to include the methodologies and procedures to achieve a fully coordinated design covering all aspects of interface requirements including; identification, management, control and validation.

9.6.3 The Contractor's IMS shall include as a minimum;

a. the development and maintenance of an Interface Register (database)

b. a Coordinated Design Interface Programme (CDIP).

9.6.4 The Contractor shall provide the Engineer with access to the IMS and or specific details of any interface item or interface specification, at any time.

9.6.5 The Contractor's IMS shall include the use of BIM processes to confirm design and construction coordination in the delivery of the work under the Contract. The output from these processes shall be used to demonstrate engineering assurance in accordance with the Employer's Requirements for Systems Assurance.

9.7 Responsibility Interface Matrix and Interface Sheets

9.7.1 The Contractor shall coordinate his design and construction of the Works with all stakeholders.

9.7.2 The Contractor shall develop a Responsibility Matrix to show levels of detail of each interface, as required by his IMS.

9.7.3 The Contractor shall submit to the Engineer Interface Sheets to be consistent with his Design Documents in accordance with his Interface Management System.

9.7.4 The Responsibility Matrix and Interface Sheets shall identify the responsibilities of the various parties concerned with a particular interface or interfaces. The parties shall be as follows:

a. 'Lead' indicates that the Interfacing Party is responsible for leading the interface coordination, accommodating the design requirements of 'Interface 1' and / or 'Interface 2' parties etc. into their works and/or systems;

b. 'Interface 1' indicates that the interfacing party is responsible for the exchange of information necessary to specify the interface. Information exchange shall include, but not be limited to, design requirements, scheduling requirements and coordination drawings;

c. 'Interface 2' indicates that the interfacing party is responsible for the exchange of information necessary to specify the interface. Information exchange shall include, but not be limited to, design requirements, scheduling requirements and coordination drawings.

9.8 Interface Register

9.8.1 The Contractor shall create and maintain an Interface Register (database). The Interface Register shall contain specific information about all interfaces, including identification, category, description, location, interface type and status.

9.8.2 For consistency Interface Registers shall use a common format as agreed with the Engineer.

9.9 Coordinated Design Interface Programme (CDIP) and Report

9.9.1 The Contractor shall prepare a CDIP in the form of a logic linked Gantt chart. The purpose of the CDIP is to monitor and support the management of key design interfaces to ensure timely information exchange between the Contractor and the Interfacing Parties.

9.9.2 The status and summary information of all key interfaces between Interfacing Parties and the Contractor shall be included as part of the CDIP document and compiled into a report.

9.9.3 Information recorded for each interface shall include, but not be limited to:

a. interface description;

b. interface location;

c. status, indicating whether the interface is closed (meaning the design is completed and mutually agreed) or in progress.

9.9.4 The Contractor shall update the CDIP and Report on a continuous basis. Updates of the interface management documents shall be issued monthly to the Engineer for his information.

9.9.5 The format of the CDIP and Report shall be submitted, as part of the Interface Management Plan.

9.9.6 A design control interface document(s) (DCID) shall be created for each design interface. The document shall identify design inputs from all interfacing parties and will be used to demonstrate a coordinated design between all Interfacing Parties.

9.10 Interface Management Software (IMS) and Reporting

9.10.1 All interface documents shall be available in electronic format. The Contractor shall use software specifically designed for handling interface management information exchange as part of his IMS.

9.10.2 The Contractor's software (DOORS based, e.g. Comply-Pro or similar) shall be approved by the Engineer, and the data shall be made available to the Engineer at all times.

9.10.3 The Contractor shall provide and supply one copy of the software they use for Interface Management.

10 Testing and Commissioning

10.1 General

10.1.1 The testing, inspection and commissioning are the final steps in order to prove the quality control

process of each stakeholder (Contractor(s), Engineer, and Employer). The tests objectives are to check that the design requirement (functional performance, operational and technical) of the sub-system(s) and of the global transport system are achieved and respected. The Contractor shall prove that all sub-systems are compliant with the Employer's Requirements and specifications, including interfacing with Systems sub-systems. The Engineer shall check that the global transport system is compliant with the overall system performance objectives and requirements. The test process will lead to the overall transport system acceptance.

10.2 Test Plan & Procedure

10.2.1 Within sixty (60) days of the Commencement Date, the Contractor shall present for the approval of the Engineer an Inspection, Test and Commissioning Plan (ITCP) showing in as much detail as available the tests anticipated to ensure a safe and reliable operation of the Works and the integration of the Works with the rest of Phase 1 works together with an indication of the periods in which the various stages of testing will be carried out. The ITCP shall:

a. Identify the date on which the Contractor proposes to conduct each of the listed tests;
b. Describe the nature and purpose of each test;
c. State the location at which the test is to be conducted;
d. subsystem testing schedule;
e. Integrated Testing and Commissioning schedule;
f. Identify the interfaces with other Contractors that will require their attendance and/or support;
g. Identify the Contractor's requirements for the Engineer's staff to operate equipment during Integrated Testing and Commissioning and Trial running; and
h. Confirm safety and security deployment and safe notice and/or training for all participants.

10.2.2 Testing procedures shall be in accordance with the Employer's Requirements.

10.2.3 The Contractor shall perform all necessary testing and commissioning activities in order to ensure satisfactory operation of the completed Works and compliance with the Employer's Requirements. Tests shall be witnessed by the Engineer.

10.2.4 The Contractor shall identify the witness, inspection and hold points as required by the Contractor, the Engineer or both. The Engineer has the option to attend or otherwise any schedule tests as per CC/PCC.

10.2.5 For inspection and testing of the equipment that interfaces with other contracts, the Contractor shall coordinate with interfacing parties regarding the timing and place of the tests and the arrangements to be made for measuring or assessing parameters affected by the interface.

10.2.6 The manufacturers and places of manufacture, testing and inspection for the various items of equipment shall not be varied without the prior review of the Engineer.

10.2.7 All costs associated with testing shall be borne by the Contractor, including any expenses incurred due to re-testing caused by defects or failure of equipment to meet the requirements of the Contract in the first instance wherever the location may be.

10.2.8 The Contractor shall submit a schedule of tests to the Engineer for review, giving full details of all tests to be carried out under the Contract with standards or limits to be achieved, not less than 60 days before the tests are due to be carried out.

10.2.9 No tests shall be carried out until the schedule has received approval from the Engineer. The schedule may be submitted in stages.

10.2.10 The Contractor shall submit testing procedures to the Engineer at least 60 days prior to conducting any test.

10.2.11 Test procedures shall unambiguously show the extent of testing covered by each submission, the method of testing, acceptance criteria, the relevant drawing (or modification) status, and the location.

10.3 Test Instrumentation

10.3.1 All test instruments used during the testing and commissioning phases shall have been subjected to calibration tests in accordance with industry standards.

10.3.2 Calibration test certificates shall be supplied to the Engineer for a Statement of No Objection in duplicate and shall be signed and dated clearly identifying the type of test equipment, serial number, date of calibration test and expiry date of the calibration period. All calibration checks shall be undertaken prior to testing and, if required by the Engineer, shall be repeated afterwards.

10.3.3 All test instrumentation shall carry a self-adhesive calibration identification label which clearly identifies the serial number of the equipment, the date when calibrated and the expiry date of the calibration

10.4 Testing and Commissioning Stages

The list below gives broadly the tests leading to the Transit System acceptance of the works:

a) Factory Acceptance Tests (FAT): These generally apply to equipment, sub-assembly, items of supply and are conducted at the factory before dispatch. FAT tests include;
   i. Unit tests
   ii. Type tests
   iii. Routine tests
   iv. Functional and operational tests
   v. Integration tests

b) Tests before Completion;
   i. installation Tests (IT): Visual inspection of all the equipment within the identified commissioning lot together with all equipment, cable and earthing tests to demonstrate that the equipment has been installed in accordance with the design and that it is safe to be energised with permanent power
   ii. Partial Acceptance Tests (PAT): Test of components and sub-systems, to prove functionality and compliance with the specifications based on the equipment contained within a defined commissioning lot
   iii. System Acceptance Tests (SAT): Test of components, sub-systems and systems alone, to prove functionality and compliance with the specifications. This testing phase combines all identified commissioning lots of one primary system.

c) Tests after Completion
   i. System Integration Tests (SIT): Tests to prove the functionality of the different systems together, in particular the technical interfaces between the different primary systems
   ii. System Performance Tests (SPT): To prove the overall inter-operability of all independent pre-commissioned systems. This includes the proof of compliance with the overall system specifications

d) Trial Running
   i. Official Review by KRIDE,
   ii. Approval by Statutory Authorities,
   iii. Integrated testing and commissioning
   iv. RDSO and the Commissioner of Railway Safety,
   v. Regular Revenue Service verification and service trials,
   vi. RAMS Demonstrations.

10.4.1 Testing and Commissioning activities shall be divided into three areas, covering Civil, MEP and Architecture. The Civil and MEP Testing and Commissioning activities will be undertaken during the construction phase, and the Architecture Testing and Commissioning activities will be covered during the initial design phase. The Testing and Commissioning activities relating to these areas are described further in the following section.

10.5 General Testing

10.5.1 Prior to construction, all materials shall be tested and certified by the manufacturer before being delivered to site. Certifications of testing shall include all reports of inspections and/or tests and submitted to the Engineer for approval.

10.6 Mechanical, Electrical and Plumbing Testing and Commissioning

10.6.1 If a permanent power supply is not available during any step of the testing and commissioning activities, it is Contractor's responsibility to provide temporary power of adequate size to carry out the Testing and Commissioning activities. Para 11.4.2 may also be referred.

10.6.2 It shall be necessary for the purposes of commissioning to delineate the testing and commissioning into phases, as previously stated in Clause 13.4.

10.6.3 At the end of each test phases the Contractor shall provide the test results to the Engineer. Any deficiencies and or deviations from the reviewed detailed design for the installation, testing and performance of the equipment and/or system shall be confirmed.

10.7 Mechanical, Electrical and Plumbing Certification

10.7.1 The Contractor shall provide the following certification for MEP installation s;

Timing	Stage	Test		Certificate
Test before Completion	Stage 1	Factory Acceptance Test	FAT	FAT
Test before Completion	Stage 2	installation Test	IT	installation Release Notice (IRN)
Test before Completion	Stage 3	Partial Acceptance Tests	PAT	Pre-Commissioning Certificates (PCC)
Test before Completion	Stage 4	System Acceptance Tests	SAT	Partial Acceptance Certificates (PAC)
Test on Completion	Stage 5	MEP System Integration Test	SIT	Acceptance Certificates (AC)
Test After Completion	Stage 6	System Performance Test	SPT	Certificate of Completion Test (CoCT)

10.8 Test Reports

10.8.1 The Contractor shall submit to the Engineer a copy of a test reports no later than 14 days after completion of each test, whether witnessed by the Engineer or not.

10.8.2 Attendance by the Engineer of any tests or inspections shall in no way relieve the Contractor of his Contractual obligations.

10.9 Commissioning Co-ordination

10.9.1 The Contractor shall appoint a Commissioning Manager nine months prior to testing and commissioning commencing to co-ordinate all activities of the commissioning schedule, so that installation, testing, and commissioning of the system is carried out without hindrance and in a safe and satisfactory manner.

10.9.2 The Contractor shall submit details to the Engineer for approval of the proposed MEP Testing and Commissioning Manager before commencement on site.

11 Operating and Maintenance Manuals, Record Drawings

11.1 General

11.1.1 The Works shall not be considered to be completed for the purposes of taking-over (Taking Over of the Works and Sections) until the Engineer has received final operation and maintenance manuals in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Works and any other manuals specified in the Employer's Requirements for these purposes.

11.1.2 The Contractor shall supply to the Engineer provisional operation and maintenance manuals in sufficient detail for the Employer to operate, maintain, dismantle, reassemble, adjust and repair the Works (i.e. the Civil, Plant, systems, subsystems, equipment etc.).

11.1.3 The Contractor shall submit to the Engineer the operation and maintenance manuals with data sheets from the Original Equipment Manufacturer (OEM) for the equipment, systems or sub-system with their delivery to the site.

11.1.4 A comprehensive alphabetical list of suppliers, manufacturers, agents and distributors of all proprietary articles provided and incorporated into the work under the Contract. This list shall include trade names, business names, addresses, telephone and facsimile numbers, email addresses, websites etc.; six (6) copies in a durable loose-leaf binder, complete with index and alphabetical dividers shall be provided to the Engineer.

11.1.5 All manuals shall be provided in hard copy and electronic format, in both Hindi/Kannada and English language, in a format to be agreed with the Engineer (which must allow the Employer to clearly document future changes). Six (6) properly bound oil and dirt resistant hard copies shall be provided. The material for the hard copies shall be agreed with the Engineer.

11.2 Record Drawings and As-Built Records

11.2.1 The Contractor shall prepare, and keep up-to-date, a complete set of "As-Built" records in hard copy and digital format of the execution of the Works, showing the exact As-Built locations, sizes and details of the work as executed. Weights of assemblies shall be shown on the Drawings. These records shall be kept on the Site.

11.2.2 All As-Built drawings shall be checked and endorsed by the Designer(s) respectively.

11.2.3 The Contractor shall obtain the consent of the Engineer as to the size, the referencing system, and other relevant details of the As-Built Records.

11.2.4 Prior to the issuance of any Taking-Over Certificate the Contractor shall supply all the As-Built Records.

11.2.5 Three hard copies and one digital copy shall be supplied to the Engineer prior to the commencement of the Tests on Completion.

11.2.6 The electronic format of the As-Built drawings will be confirmed by the Engineer.

11.3 Maintenance Drawings

11.3.1 The Contractor shall provide such drawings as may be required for the operation and maintenance the Works (i.e. the Civil, Plant, systems, subsystems, equipment etc.) to the Engineer.

11.3.2 Information contained on the drawings shall include but not be limited to:

a. sizes of all fixtures;
b. manufacturers code drawing and reference numbers;
c. wiring diagrams to appropriate standards, including internal wiring of sealed unit items;
d. appropriate standards;
e. setting dimensions and tolerances.

11.4 Spare Parts Lists

11.4.1 The Contractor shall submit spare parts lists and illustrated parts lists to the Engineer at least 60 days prior to conducting any of testing and commissioning activities. Cost of spare materials supply shall be included in the Quoted price.

11.4.2 The Contractor shall supply minimum Five (5) percent spare materials for Granite; Vitrified Tiles; raised flooring and false ceiling beyond the DNP period.

11.4.3 The Contractor shall supply spare parts for Mechanical, Electrical and Plumbing installation s during the DNP as per Original Equipment manufacturer (OEM) catalogues and supplier recommendations and as approved by the Engineer.

11.4.4 Within 60 days of Commencement of DNP, the Contractor shall prepare and submit the list of likely spares and the OEM details including sources and approximate quantities of Spares assessed for one-year requirement to be maintained by the owner/Employer after the completion of DNP. This list is to be submitted as required in the format accepted by the Engineer.

12 Employer Training

12.1 Operations and Maintenance Training Requirement

12.1.1 The Contractor shall provide comprehensive training to employees of the Employer's Operations and Maintenance (O&M) team and the Engineers personnel. The training shall confirm technical matters on each O&M activity according to the intended function, as well as providing training for personnel who will become trainers in the intended functions.

12.1.2 Within six months of the Commencement Date the Contractor shall submit to the Engineer a Training Plan to provide a detailed explanation of the training philosophy, objectives and methodology for the Employer's O&M team such that personnel on completion of training shall have the knowledge and/or skills required to perform the intended functions.

12.1.3 The Contractor shall provide training in classroom suitable for required training. It may be at site or at the Employer's location.

12.2 Operations and Maintenance Training Objectives

12.2.1 The content, timing and duration of the training programme shall be such that:

a. personnel trained by the Contractor will be able to operate and maintain the equipment/systems in the designated manner with maximum reliability and economy;

b. trainers trained by the Contractor shall be competent to train personnel to be able to operate and maintain the equipment/systems.

12.2.2 Training objectives in terms of minimum standards to be achieved by each trainee shall be clearly defined by the Contractor for each trainee post, including the future trainers.

12.3 Selection of Operations and Maintenance Trainees

12.3.1 The Contractor shall submit to the Engineer for review, 60 days before the commencement of the proposed training, the range of staff, including the service's instructors, for which training is recommended.

12.3.2 The Contractor shall submit measurable selection criteria for entry to each trainee post, indicating the minimum standards required:

a. qualification and/or educational standards;

b. basic skills and knowledge levels, any special aptitudes necessary such as manual dexterity;

c. oral and written ability.

12.4 Operations and Maintenance Training Methods

The training shall be planned and carried out in a manner suitable for the intended occupation, and shall consist of:

a. formal off-the-job theory and practice,
b. practical on-the-job follow-up experience.

12.4.1 The Contractor shall demonstrate that the trained staff and instructors have achieved the minimum standards established for each trainee post.

12.4.2 The Contractor shall provide one original and five coloured copies of the Training Manual for use by the Employer for conducting in-house training.

12.4.3 The Contractor shall submit training programmes and syllabi and measures for monitoring the progress of both the training programmes and individual trainees to the Engineer for review not later than six (6) months after Commencement Date. Programmes shall clearly show commencement and completion dates and the number of trainees for each training course. The programme shall clearly identify whether the training is off-the-job theory or on-the-job.

12.4.4 Syllabi shall clearly indicate:

a. course title and objectives;
b. course content or attachment objectives;
c. location of training course and/or attachments;
d. methods of training.

12.4.5 Methods for monitoring progress shall relate to:

a. theoretical tests;
b. practical tests;
c. progress reports.

12.4.6 Records of trainees' progress shall be kept up-to-date and made available for examination when required to do so.

12.4.7 Copies of individual trainees' records showing all test results and reports of progress shall be issued to the Engineer on completion of each training course or attachment.

12.5 Contractor's Operations and Maintenance Training Staff

12.5.1 The Contractor shall ensure that qualified staff are provided for all off the job formal theoretical and practical training.

12.5.2 Where the trainees are attached to the Contractor (or his Subcontractors) for the purposes of gaining job experience, all such trainees shall be properly supervised and monitored by a qualified training supervisor to ensure that each trainee has the best opportunity to benefit from the theoretical and practical experience.

12.6 Operations and Maintenance Training Locations

12.6.1 The training shall be carried out at such locations where the greatest benefit for trainees may be gained. This may be in Country, at places of manufacture, assembly or testing, or at such other locations as may be necessary.

12.6.2 The Contractor shall be responsible providing all the logistics for the training of the Employers staff which shall include but not limited to classrooms facilities, projector, handouts, training tools and material, etc.

12.7 Operations and Maintenance Training Equipment

12.7.1 In general, the Contractor shall use plant and equipment specifically set aside for training purposes. However, he may use as may be agreed with the Engineer, plant and equipment being erected, tested or commissioned for the training, when no other such plant or equipment is available. The Contractor shall not use spare parts that are to be used as work under the Contract for this purpose.

12.7.2 The supply of plant, equipment and materials shall be sufficient both for the persons trained by the Contractor and for those to be subsequently trained.

12.8 Administration

12.8.1 The Contractor shall:

a. be responsible for the general welfare of trainees under their control;

b. submit procedures which will enable him to control, and to repatriate where necessary, those trainees not found to be responding to training as a result of:

i) aptitude;

ii) discipline;

iii) incorrect selection;

iv) any other cause.

13 Systems Assurance

13.1 General

13.1.1 The Contractor shall apply systems assurance throughout the life cycle stages listed in EN 50126, including design, construction, manufacture, installation, testing and commissioning and Defects Notification Period, to enable the Employer to achieve safety certification for an operational railway.

13.1.2 The Ministry of Railways and RDSO have the responsibility for safety certification and technical clearance of the BSRP System. An on-line procedure for the Safety Certification and Technical Clearance of IR / BSRP/ Metro Systems has been issued by RDSO for guidance to Administrations and Project Partners.

13.2 System Assurance Activities

13.2.1 The Contractor's system assurance activities shall include but not be limited to the following:

a) methods of operation;

b) Reliability, Availability, Maintainability, and Safety (RAMS)considerations;

c) maintenance regimes;

d) required competence levels of Employer's Personnel O&M staff;

e) human factors including ergonomic studies that have been carried out.

13.2.2 Analyses shall consider the system/sub-system in normal operation and in specific emergency or degraded conditions for which the system/sub-system is being designed.

13.2.3 Hazard identification and safety analyses shall be conducted to identify and record all reasonably foreseeable hazards in the operation of the work under the Contract and assess the risk that each hazard represents to its operation.

13.2.4 Prior to completion of each design stage (DS1 and DS2), the Contractor shall provide a list of key safety issues, Reliability Critical Items List (RCIL) and Safety Critical Items List (SCIL) to the Engineer for review.

13.2.5 The Contractor shall demonstrate that the apportioned RAMS targets at sub- system and equipment level are met or bettered.

13.2.6 The Contractor shall submit for the Engineer's review an engineering safety validation plan, including but not limited to:

a) the list of safety field verifications and validations for systems/ subsystems/ equipment during construction, manufacturing, installation and systems interfaces integration testing;

b) the schedule of safety field verifications and validations;

c) the purpose of each verification and validation;

d) the acceptance criteria by reference to any related safety study;

e) the recommended method of testing, including the processing of key software safety issues in

verification and validation;

f) the plan for witnessing the results of verification and validation;

g) the recommended format of the engineering safety validation report;

h) the submission list of the Contractor's test reports;

i) the recommended assessment procedure with respect to deficiencies in the verification and validation results.

13.2.7 The Contractor shall carry out a design safety review, RAMS review and analysis of any design changes and shall submit the updated design systems assurance deliverables to the Engineer for review.

13.2.8 The O&M manuals and related documentation produced by the Contractor shall include all the necessary details required by the Employer to maintain the achievement of the RAMS targets at the system level.

13.2.9 The Contractor shall commence the use of the Failure Reporting Analysis and Corrective Action System (FRACAS) prior to any factory or site acceptance tests and report to the Engineer on a monthly basis.

13.3 Requirements Management

13.3.1 Within 60 days of the Commencement Date, the Contractor shall submit to the Engineer for review, a Requirements Management Plan {RMS}.

13.3.2 The Contractor shall implement a Requirements Management System (RMS) that shall remain in effect during the execution of the work under the Contract. The Contractor shall submit the RMS documentation for review by the Engineer.

13.3.3 The Contractor's RMS shall clearly identify requirements that have a direct impact on safety and performance.

13.3.4 The Contractor shall supply one copy of the requirements management software to the Engineer for the Engineers sole use, together with training in its use for four (4) people. The Contractor may use Dynamic Object-Orientated Requirements System (DOORS) or similar software for the RMS.

13.3.5 The Contractor shall provide evidence to the Engineer that there are regular reviews of the performance of the RMS and that actions are implemented to address improvement opportunities as and when they are identified.

13.4 Configuration Management

13.4.1 Within 60 days of the Commencement Date, the Contractor shall submit to the Engineer for review, a Configuration Management Plan {CMP}.

13.4.2 The Contractor shall implement configuration management throughout the duration of the Works.

13.4.3 The Contractor shall use and maintain an automated and integrated software package to perform configuration management functions for the Works.

13.4.4 The Contractor shall supply one copy of the configuration management software to the Engineer for the Engineers sole use, together with training in its use for four (4) people.

13.4.5 RAMS target: The Contractor shall ensure the RAMS target for operation critical items achieves 99.94%, i.e. the replacement can be completed in the planned maintenance period between 1am and 6am.

13.5 Systems Assurance Deliverables

13.5.1 The key systems assurance deliverables shall include but not be limited to the items listed below at the indicated times for submission. All system assurance deliverables shall be submitted to the Engineer for review.

Sr. No	System Assurance Deliverable	Submission Timing
1	Preliminary hazard analysis report	90 days from Commencement Date
2	Hazard log	90 days from Commencement Date
3	Reliability, Availability and Maintainability Analysis {RAM} Plan	90 days from Commencement Date
4	Fire and life safety report	Along with DS1 & DS2
5	Quantitative risk analysis report including Fault Tree Analysis (FTA)	Along with DS1 & DS2
6	System and subsystem hazard analysis	Along with DS1 & DS2
7	Interface hazard analysis report	Along with DS1 & DS2
8	Operations and support hazard analysis	Along with DS1 & DS2
9	Safety critical items list	Along with DS1 & DS2
10	Safety Failure Modes, Effects and Criticality Analysis (FMECA)	Along with DS1 & DS2
11	Hazardous materials list	Along with DS1 & DS2
12	Recommended spare parts and special tool list	Along with DS2
13	Operations training plan	Along with DS2
14	RAM demonstration report	Upon completion of testing and commissioning of the Works
15	Operations and maintenance plan	Along with DS1 & DS2
16	Electromagnetic Compatibility (EMC) Plan	Along with DS1
17	Preliminary EMC Hazard Analysis	Along with DS1
18	EMC Hazard Log	Along with DS1
19	System EMC Requirements	Along with DS2
20	Earthing and Bonding Plan	Along with DS1
21	EMC Hazard Analysis	Along with DS1
22	EMC Demonstration Report	Upon completion of testing and commissioning of the Works
23	EMC Safety Case	Upon completion of testing and commissioning of the Works

14 Environmental and Sustainability Management

14.1 General

14.1.1 The Contractor shall fully comply with CC/PCC and 8C of Employer's Requirements. Compliance with the Employer's requirements shall not relieve the Contractor of any of their statutory duties, obligations or responsibilities under the Contract or Law

14.1.2 The environmental welfare of all personnel engaged in the work under the Contract, the general public, the avoidance of damage to property, and the prevention & mitigation of adverse impacts on the environment, cultural heritage and social values is of paramount importance to the Employer. The Contractor shall ensure that all operations are conducted in such a manner as to minimise to acceptable levels or eliminate the negative risks to the environment and where opportunities exist, maximise the beneficial factors to the environment.

14.1.3 'Environment' shall be defined as 'The biosphere which includes the living beings whether human, animal or plant and all the surroundings, such as air, water and soil, and all it contains, such as solid, liquid or gas substances or radiation, and any installation s built by man and industries or inventions created by man.'

14.1.4 The Contractor shall implement an environmental management system that complies with all applicable Laws and standards.

14.1.5 The Contractor's environmental management system shall comply with the requirements documented within EN ISO 14001 Environmental Management Systems, which is the minimum standard to be adopted by the Contractor. This standard does not relieve the Contractor of their liabilities under the applicable Laws and where there is a discrepancy in the documents, the higher requirement will take precedence.

14.1.6 The Contractor's overall philosophy for environmental management shall embody a culture of continuous improvement via the plan, do, check, act cycle as documented by EN ISO 9001. The Contractor shall regularly review the performance of the environmental management system, and implement improvement actions as and when required, providing evidence to the Engineer of the same.

14.1.7 The Contractor shall obtain "Platinum Rating Certification" as per prevailing IGBC Green Mass Rapid Transit System (MRTS) Rating.

14.2 Personnel

14.2.1 The Contractor shall ensure that their staff that are responsible for the Site environment are adequately trained regarding environmental management and are provided the necessary authority to suspend any work where there is imminent risk of an environmental impact.

The Contractor shall set up an environmental team to execute the environmental requirements

To lead his environmental team, the Contractor shall deploy an Environmental Manager who shall be responsible for environmental control, pollution monitoring, and record keeping and be available to the Employer for resolution of environmental issues.

The duties of the Contractor's environmental team shall include (but not limited to)

- To monitor the various environmental parameters as required by the Manual
- To inspect, investigate and audit the work methodology with respect to environmental mitigation and control
- To anticipate environmental issues before they arise and plan for their mitigation
- To audit and prepare audit reports, weekly/monthly reports on site environmental conditions for submission to the Engineer.
- To maintain records for obtaining "Platinum certification from IGBC".

14.3 Breach of Environmental Obligations

14.3.1 Serious or repeated breaches of the statutory regulations for the environment, or other disregard for the environment, may be reasons for the Engineer to exercise their authority to require the removal from the Site of any employee of the Contractor or a Subcontractor.

14.3.2 Once removed, such person shall not be re-employed on the Contract.

14.3.3 The Engineer shall have the right to order the suspension of any or all of the Contractor's activities where it is deemed that to continue such activity or activities may have an adverse impact on the environment.

14.3.4 Where the Engineer orders a suspension of the Contractor's activities, such suspension shall continue until the Contractor has satisfied the Engineer that satisfactory corrective action has been taken to eliminate the impact that was the subject of the suspension.

14.4 Environmental Management System Manual (EMS Manual)

14.4.1 The Contractor shall submit a copy of their EMS manual and an Environmental Management Plan to the Engineer for approval within 28 days of the Commencement Date.

14.4.2 The Contractor is responsible for all acts of his Sub-contractors and shall ensure that their Subcontractors follow and comply with the Contractor's EMS Manual, Environmental Management Plan plus Project Environmental Risk assessments and Method Statements.

14.4.3 The Contractor's EMS manual shall contain the procedures required for carrying out the work activities on the work under the Contract. The EMS manual shall be regularly reviewed and up-dated to reflect changes to work practice and changes to legislation. Copies of proposed changes are to be submitted to the Engineer for review prior to inclusion and implementation.

14.5 Environmental Management Plan (EMP)

14.5.1 The Contractor shall devise and implement an Environmental Management Plan in accordance with the Employer's EIA Report and Employer's Requirements / Environmental Management Manual, which address the conditions and proposed work activities for the construction phase of the work under the Contract.

14.5.2 The EMP shall include a policy statement signed by the Chief Executive Officer of the Contractor (or other senior officer) declaring that environmental management shall be given high priority in all aspects of the Contract and in the discharge of their contractual obligations. The Contractor's policy shall be aligned to the Employer's environmental policy.

14.5.3 The EMP shall also set out in detail the approach that will be adopted in dealing with the potential environmental impacts from the various different construction activities. The EMP shall address all the potential impacts (both positive and negative) outlined in the EIA Report and shall follow the EMP outline contained in Employer's Requirements and Environmental Management Manual. The Contractor shall submit an EMP for review by the Engineer 28 days prior to the commencement of the construction activities.

14.6 Risk Assessments

14.6.1 The Contractor shall carry out a detailed Environmental Risk Assessment, which shall address the environmental aspects of the work under the Contract.

14.6.2 The environmental risk assessment shall be submitted to the Engineer for approval within 60 days of the Commencement Date or at a date agreed with by the Engineer.

14.6.3 The findings of the assessment shall be incorporated in the EMP along with relevant method statements, and other documents as required.

14.7 Environmental Inspections and Monitoring by the Contractor

14.7.1 The Contractor shall conduct dedicated site environmental inspections at least once a month or more frequently as circumstances dictate which are to be attended by the Contractor's Environmental Manager and (or) the Contractor's Representative.

14.7.2 A brief report of the monthly inspection shall be made and shall include the actions taken to resolve any problems or shortcoming discovered during the inspection. The report shall be made available for audit purposes and be discussed at the relevant meetings.

14.7.3 A comprehensive environmental inspection checklist for the use of the Contractor's Site staff when inspecting the Site is to be formulated by the Contractor and submitted for review by the Engineer.

14.7.4 The checklist shall indicate the standard to be achieved on any particular aspect of environmental management, and be compiled in such a way that allows the inspector to enter their actual findings for instant comparison and subsequent rectification.

14.7.5 When completed, the checklist shall be kept for record purposes so that it is available to the Engineer for audit purposes.

14.7.6 A grading system shall be established which grades the area inspected as either; 'acceptable' or 'unacceptable'.

14.7.7 Where an area receives a grading below 'acceptable', necessary action is to be taken to rectify the problems raised and a further inspection shall be conducted after 7 and 14 days to assess the conditions.

14.7.8 The Contractor is to advise the Engineer of the date of the monthly inspection. The Engineer may send a representative to assess the thoroughness of the inspection.

14.7.9 The Contractor shall undertake all necessary environmental monitoring including the setting up of all monitoring stations to comply with the requirements of all environmental legislation, and regulations. The minimum requirements for locations of monitoring stations are indicated in the EIA Report. Output data from the monitoring stations shall be provided to the Engineer in the monthly reports.

14.7.10 The monitoring and audit requirements, including monitoring locations are given in the Employer's EIA Report.

14.8 Environmental Audits by the Contractor

14.8.1 The Contractor shall conduct regular (at least every three (3) months) internal environmental audits on both the environmental management system and the physical site conditions. The audits shall be performed to the same criteria and using the same grading and benchmarking as the Engineer's audits.

14.8.2 The audits shall be conducted by person(s) reviewed by the Engineer who are qualified and competent to carry out Environmental audits. The documentation generated by the audit process, including score sheets, shall be made available to the Engineer for performance measurement purposes.

14.8.3 The audits shall include the work of Subcontractors of all levels.

14.8.4 The Contractor shall advise the Engineer of the date of all the audits. The Engineer may send a representative to assess the thoroughness of the audit.

14.9 Reporting of Environmental Incidents

14.9.1 The Contractor shall notify the Engineer immediately of any environmental incident. Initial notification may be verbal but shall in any event, be followed by a preliminary written report, in a format that has been reviewed by the Engineer, within 24 hours of the incident. A detailed written report shall be submitted within three (3) days.

14.9.2 The Contractor is required to report all incidents to the Engineer and relevant authorities.

14.10 Monthly Reports

14.10.1 The Contractor shall be fully responsible for submitting reports, notices and information to relevant authorities where there is a statutory requirement to do so.

14.10.2 The Contractor shall provide environmental performance data as required by the Engineer to a scope and frequency determined by the Engineer, to measure the Contractor's compliance with all applicable Laws, other enactments, the Contractor's EMS manual and Environment Management Plan.

14.10.3 The Contractor shall, as part one of each monthly progress report, submit a Site environmental report. Prior to submission, the Contractor's Representative shall endorse the Site environmental report.

14.10.4 The environmental report shall comprehensively address all relevant aspects of environmental management.

14.10.5 The Contractor shall submit reports or incident analysis, in an agreed format, as and when required by the Engineer.

14.10.6 Monthly Report content shall include monitoring of;

a. Batching and Crushing Contractor's Equipment
b. Air Quality Management
c. Site Water Quality Management
d. Site Noise Management
e. Waste Management
f. Socio-economic Management
g. Ecology Impact Management
h. Housekeeping Management

14.11 Sustainability

14.11.1 The work under the Contract shall be designed, constructed and operated to achieve a minimum of IGBC Platinum Rating Certification as per prevailing IGBC Green Mass Rapid Transit System (MRTS) Rating.

14.11.2 All temporary traffic management shall be in accordance with the logistics concepts detailed in the Logistics and Supply section of the Employer's Requirements.

14.11.3 The Contractor shall investigate ways to mitigate potential negative impacts by understanding the additional burdens the project will place on existing infrastructure and using appropriate design strategies to reduce it. The Contractor shall work with the appropriate municipal agencies to explore potential new transportation infrastructure.

14.11.4 The Contractor shall identify the basic amenities and their proximity to BSRP stations and address how the station layout and Site design can be done to ease accessibility. This shall include consideration of the position of entrances, walkways and roads etc., and the location of existing amenities and services. A field survey shall determine the range of amenities, services and facilities accessible from the proposed Site.

14.11.5 The Contractor shall control the amount of exterior lighting features than can create light pollution. The Contractor shall review and consider lighting ordinances and bylaws relevant to the Site. The approach taken shall address how to minimise exterior lighting, avoid upward lighting, and use efficient and shielded fixtures.

14.11.6 The Contractor shall work with other Stakeholders and other municipal agencies to provide bus/taxi stations at the BSRP stations to have a complete network of mass transit systems.

The Contractor shall collect store and remove solid and harmful waste in accordance with Legal requirements. Furthermore, the Contractor shall identify potentially harmful materials that may be present in the project and have in place appropriate management practices. Additionally, the Contractor shall develop drainage and run-off strategies to minimise potential sewer and waterway contamination by treating or separating harmful materials. Strategies and approaches may include

point-source control at drain locations as well as filtration and treatment systems on a building or cluster level.

14.11.7 The Contractor shall mitigate the project's impact on existing or future adjacent buildings with respect to shading and daylight access. The Contractor shall conduct simulations to determine the potential amount of shade and shadows that will fall on adjacent Sites. The design shall address how the proposed building's location, orientation and height can minimise the obstruction of daylight.

14.11.8 The Contractor shall minimise rainwater runoff, by providing proper rainwater harvesting system as described below. Specifically, the Contractor shall address how the project can collect, store, and treat all water that falls on the building and pavement. Plants and trees shall be allowed to absorb rain that falls directly onto landscaped areas. Handling the rainwater may require several types of systems and the approach taken shall address how to create a comprehensive, integrated water management system.

14.11.9 Rain Water Harvesting (RWH)

Rain Water Harvesting shall be provided for the catchment area of the stations. A minimum of two RWH pits shall be provided at each Station and one at every span. The Contractor shall design the RWH catchment system to be of sufficient capacity to ensure there is no overflow from the pit. The Contractor shall submit the RWH system design for the Engineer's review.

a. The system shall be designed to perform effective ground water recharge and it shall require minimum maintenance.
b. The following IS codes (latest version) shall be complied with;
    i. IS 2800 – Code of practice for construction and testing of tube wells
    ii. IS 11189 – Methods for tube-well development
    iii. IS 12818- (PVC-U) screen and casing pipes for bore/tube-wells
    iv. IS 4097 – Gravel for use as pack in tube-wells
c. All connections made for rain water harvesting system shall be leak-proof and watertight.
d. The testing of the ground water recharging system, including the monsoon period, shall be carried out to the satisfaction of Engineer.

14.11.10 The Contractor shall establish adequate energy demand performance levels for the proposed station or depot building design. This shall reduce the energy needs for the building to maintain adequate thermal comfort conditions. The approach taken shall address all building design features that have a major impact on the energy demand.

14.11.11 The Contractor shall develop a strategy for establishing adequate energy delivery performance levels for the systems that serve the building. The approach taken shall address all the features of building systems that have a major impact on energy delivery and consumption.

14.11.12 The Contractor shall design buildings and their supply systems which will minimise the use of fossil fuels. The designs shall address all building and system features as well as their connections to the delivery networks that consume primary energy sources.

14.11.13 The Contractor shall develop and implement a strategy for encouraging the design of buildings and their supply systems and networks that minimise CO2 emissions. The strategy shall outline how to achieve those standards by addressing system features at all supply network scales that impact the generation of CO2.

14.11.14 The Contractor shall develop a strategy for encouraging the design of buildings and their supply systems and networks that minimise oxides of Nitrogen, Sulphur di-oxide and dust emissions. The design shall outline how to achieve those standards by addressing system features at all supply network scales that impact the generation of Mono-nitrogen oxides, sulphur oxide and dust.

Consideration shall be given for specifying efficient equipment and fixtures, reusing rainwater and grey water for non-potable applications, installing and using water sub-metering facilities, and using efficient landscape irrigation techniques. Reducing water consumption may require several types of

these systems and the design approach shall address how to integrate those systems into a comprehensive solution. The solution shall address using water efficiently and recycling water where possible.

14.11.15 The Contractor shall identify products and materials available from within the region and determine which of these products and materials can be used during the project development. The Contractor shall also consider and document the weight and the source of the building materials.

14.11.16 The Contractor shall where required provide a comfortable environment with negligible fluctuations in temperature and humidity to ensure the health and comfort of the users of BSRP stations and depots. The Contractor shall determine the environmental conditions required for users, programmes, and spaces in the project. Furthermore, he shall address how active conditioning, passive conditioning, or a combination of both can work with the building design and building envelope.

14.11.17 The Contractor shall use indoor materials with low VOC emissions and avoid materials and mechanical systems that can emit harmful contaminants. The Contractor shall identify the emission rates of specified materials and how to effectively mitigate any harmful emissions.

14.11.18 The Contractor shall develop and implement a strategy for encouraging effective natural ventilation in conjunction with mechanical systems. The Contractor shall address how to create cross ventilation, the number, location and type of windows, and the type and degree of user-control. The strategy shall also determine the ways in which natural ventilation and mechanical ventilation systems will work together to meet heating and cooling demands while reducing energy consumption.

14.11.19 The Contractor shall develop a design approach for ensuring occupant well-being and comfort through the use of mechanical ventilation systems. Ventilation rates and air quality levels shall meet the minimum compliance requirements of accepted standards. The Contractor shall address the location and protection of fresh air intake vents, the type and degree of user-control, and the ease of maintenance and service. The design approach shall also include how to integrate natural ventilation strategies with the mechanical ventilation system.

14.11.20 The Contractor shall develop and implement a strategy for reducing hazardous particulates and chemical or biological contaminants in the indoor air. This may include physically isolating areas that may generate harmful contaminants, providing adequate barriers between isolated areas and adjacent spaces, and using dedicated exhaust systems to mitigate the potential hazards of airborne contaminants. The Contractor shall identify potential sources of hazardous contaminants and determine what containment and control measure will be required.

14.11.21 The Contractor shall develop a design approach for preventing and controlling glare within buildings. The design may include physical measures such as light shelves, blinds, louvers, fins, shades or tinted glazing to control glare. Consideration shall be given to the special arrangement of the building interiors to minimise discomfort from excessive glare and contrast.

14.11.22 The Contractor shall ensure there are adequate illumination levels for the visual comfort and well-being of building users. He shall address how to use daylight to reduce the energy needed for electrical lighting, and include the potential use of automatic lighting control systems to further reduce energy consumption.

14.11.23 The Contractor shall include a strategy for developing designs that reflect the cultural identity and traditions of India and Karnataka. The design approach shall address how Site design, building form, material palette, and overall aesthetic quality can reference the culture and heritage of India. Furthermore, the proposed building design must not degrade the cultural character of any existing buildings on adjacent properties. When designing the features and components of the new building, consideration shall be given to existing building fabrics.

14.11.24 The Contractor shall maximise the procurement of construction-related products and services from within the region in order to support Indian national economy. The Contractor shall investigate the regional availability of products and services and develop a plan to use and employ local companies

and firms where possible.

14.11.25 The Contractor shall develop and implement a strategy for installing energy sub-metering facilities to monitor and evaluate energy system performance and consumption during building operations. This shall include metering and monitoring of major energy systems in conjunction with data logging to provide for continued accountability of energy consumption over the building's lifespan. The strategy shall include the types of building systems to be monitored, the best method for installing, using, and servicing the monitors, and ways in which the data will be interpreted and used.

14.11.26 The Contractor shall be required to install an effective leak detection system for all water and wet areas, including the buildings.

14.11.27 The Contractor shall be required to develop and implement a strategy for the collection, storage, and removal of recyclable materials. He shall design sufficient sorting and storage spaces for the anticipated recycling materials produced by the project. These spaces shall be properly isolated and ventilated. Consideration shall be given to the location of these services so as to be proximal to other waste handling services.

14.11.28 The Contractor shall install a Building Automation System (BAS) that controls and monitors major building systems including cooling, ventilation, and lighting. The Contractor must also develop a preventive maintenance plan. The plan shall ensure that components are tested and calibrated at intervals recommended by the BAS manufacturer.

15 SCOPE OF WORK

15.1 Brief Scope of Work

15.1.1 This scope of work is to be read in conjunction with other Tender Documents & Drawings.

(i). Detailed Design and Construction of all Civil, Structural, including roof Structure, Entry/Exit structures, staircases, Foot over Bridge (FOB), and all other associated works for Platform & Concourse including design roof for Solar Panel installation in all structures.

(ii). Detailed Design and Engineering of all Mechanical, Electrical and Plumbing (MEP) works, Architectural finishes and Façade works, for Elevated and At-Grade BSRP Stations.

15.1.2 A brief narrative for corridor 2 stations has been presented below for a better understanding, as this document covers the station design criteria of only corridor-2 stations.

Table 2: Corridor 2 Stations

Sl. No	Name of the Station	Typology
1	Benniganahalli	Interchange Elevated Station
2	Kasturi Nagar	At-Grade Station
3	Sevanagar	At-Grade Station
4	Banaswadi	At-Grade Station
5	Nagawara	At Grade Station (On raised formation)
6	Kanaka Nagar	At Grade Station (On raised formation)
7	Hebbal	At-Grade Station
8	Mathikere	Elevated Station

Sl. No	Name of the Station	Typology
9	Yeshwantpur	Interchange Elevated Station
10	Shettyhalli	At-Grade Station
11	Mydarahalli	At-Grade Station
12	Chikkabanavara	Elevated- Station

18.1.3 Stations will vary in complexity along the route and have been located by an interactive process influenced by ridership forecasts, interchange requirements with other modes, station spacing, alignment, utilities, road and pedestrian requirements, interfaces with developments and environmental considerations.

18.1.4 All Station shall be designed with 205-meter platform & Concourse length.

15.2 General

15.2.1 The design and construction of the Works shall be developed in accordance with the Employer's Requirements and the Contractor's Technical Proposals.

15.2.2 The Structures shall be designed for 100-year operational life.

15.2.3 The Contractor shall provide all the software confirmed in the Employer's requirements in a timely manner to permit the Engineer to review the Contractor's submissions.

15.2.4 All the works in this Contract are covered under Schedule 'A', and Schedule 'B'.

15.2.5 **The Schedule 'A': Lumpsum EPC Price, consists of:**

Detailed Design and Construction of all Civil structure, Structural steel including roof works, Entry/Exit structures, FOB including Design provision for Solar Panel installation for all 12 Stations and other associated works as indicated in tender drawings.

and

15.2.6 **The Schedule 'B' consists of:**

(i) Detailed Design and engineering of all Architectural works (Front of House (FoH) and Back of House (BoH) in public and non-public areas which includes Concourse, Platform, Foot over Bridge (FoB), Entry / Exit, plaza area, roof sheeting; with combination of polycorbonate sheet as per codal norms for lighting, system rooms, masonry / block-work walls, mullions, tie beams, lintels, plastering including all Façade works including the required supporting structural elements etc., as approved by the Employer / Engineer. And

(ii) Detailed Design and Engineering of all Mechanical, Electrical and Plumbing (MEP) Works.

15.2.7 **The Schedule 'C'** Consists of provisional sum and shall include All Utility shifting under KPWD SR (2021-2022)/BESCOM/BWSSB.

15.2.8 The Contractor shall be responsible for getting approval, co-ordination and supervision of execution of works pertaining to relocation/shifting/removal of above and below ground utilities, through respective Utility agencies. The payment for these Items will be made under Schedule 'C'. The

Contractor will be entitled for payment for co-ordination and supervision charges for the executed works as defined in the Pricing Document (Section 9). Any delay in completion of these works shall not relieve the Contractor's obligation and it shall be at Contractor's own risk and cost.

15.2.9 **The Schedule 'A'** shall include Design and Construction of all Civil structure, Structural steel including roof works, Entry/Exit structures, FOB including Design provision for Solar Panel installation as detailed in the Employer's Requirements, including but not limited to:

i. progressive Design Assurance (including Design Workshops and Design Gate Review with the Engineer and Project Partners);
ii. all site survey and setting out work and barricading of minimum 2m height;
iii. site clearance and establishment of the site boundary;
iv. offices for the Employer/Engineer, and the continuing maintenance and attendance;
v. casting yard and materials laboratory;
vi. location of underground utilities through trial trench investigation at all pier/column and foundation locations;
vii. utility retention/protection;
viii. geotechnical investigation at all piers/columns and stations foundation locations;
ix. ground treatment as and where required;
x. Station foundations, substructure, superstructure and platform roof;
xi. All Station area drainage requirement including roofing and its disposal.
xii. Sewage treatment plant including connection to the station drainage system.
xiii. shear connectors for track plinth and cross overs at Chikkabanavara Station;
xiv. station entrances, Subways and Foot Over Bridge (FOB) structures;
xv. multimodal commuter facilities at Entry/Exit Plaza level;
xvi. providing and fixing MS/RCC staircases for up and down lines for approaching the viaduct track bed from station platform as per tender drawings.
xvii. Design, Fabrication, Supply and Erection of Pre-Engineered Building (PEB) roof Structure over platforms/concourse and track way, Entry/Exits, FOB, any other structures including supporting columns, rafts, purlins etc., all complete including making provision for "first fix" structural arrangement for Passenger Information Displays (PIDs), Clocks, Cameras, Signage, solar panels etc.,
xviii. access to the station roof, FOB, Entry and Exit structures and other structures for maintenance and cleaning.
xix. temporary traffic diversion management;
xx. road widening/permanent diversion works wherever required;
xxi. site reinstatement including median (width including pier and crash barrier) final landscaping and road works;
xxii. site health and safety management;
xxiii. fire rating requirements as per relevant NFPA / NBC codes;
xxiv. site security management;
xxv. environmental management;
xxvi. quality management;
xxvii. training of the Employer's Personnel;
xxviii. shared work access to Project Partners;
xxix. rainwater Harvesting;
xxx. all types of Bearings;
xxxi. demolition and disposal of all resultant demolition materials for all structures including buildings, drains or any other structures, to facilitate the construction of the works under the Contract, including backfilling any part of the void created with suitable material and reinstate the area to

match with the surrounding ground level.

xxxii. for stations located over road, temporary arrangement is to be made for providing working platform at suitable height so that traffic run below it, unhindered and safety of road use is ensured. This arrangement shall be maintained till completion of work. The working platform in all stations has to be covered with suitable material so that the nothing falls on the road. A detailed scheme is to be submitted for approval before start of work. Temporary staging with loading deck shall be provided by the civil contractor to facilitate erection of Panels, equipment etc. of system contractors at multiple stations at same time;

xxxiii. Underground & Overhead water tanks, pump room, sump room including water proofing & finishing etc

xxxiv. Design and construction of all Expansion joints at including track bed and at floor levels of stations. The expansion joints shall not be placed above the technical room in BoH area.

xxxv. All structural steel structures shall be painted with Epoxy paint of approved colour decided by Employer;

xxxvi. Civil structure for Radio towers / Signal towers

xxxvii. Earth mat as per the requirement of E&M designs

xxxviii. Stray current arrangement.

xxxix. Preparation and submission of as built drawings.

Design & Engineering of MEP & Architectural works (Complete design)

xl. MEP services including drainage, water supply, sewage disposal, lighting (temporary and permanent), auxiliary power, Fire Life Services and spare parts etc.;

xli. foundations for the MEP equipment (water supply pumps, firefighting pumps, DB panels & AC outdoor/VRF units) in co-ordination with various service providers;

xlii. provisions for cut outs in the stations required for services in co-ordination with various system contractors;

xliii. interface, coordination and finalisation of design and installation with Project Partners;

xliv. provision for the installation and maintenance of Solar Panels on the Station Roof (supply and installation of solar panel to be carried out by Project Partner);

xlv. provision for installation and maintenance of Telecom Tetra Towers at stations and GSM Towers at each station or at a location to be approved by the Engineer (supply and installation of Telecom Tetra Tower and GSM Towers to be carried out by Project Partners);

xlvi. provision for installation and maintenance of vertical and horizontal transportation within stations and entrances (supply and installation of lifts, escalators and travellators to be carried out by Project Partners)

xlvii. provision for installation and maintenance of Signalling &Telecommunication, Automatic Fare Collection and Passenger Screen Door/Gate equipment (equipment to be supplied and installed by Project Partners);

xlviii. Power sockets to carry out maintenance work in the viaduct. Minimum requirement in crossover area.

xlix. Fire Extinguisher of powder type and CO2 type of extinguisher in all equipment rooms (SER, TER, SMR, SCR and UPS);

l. Façade loading solar panel loading shall be considered in the design;

li. provisions for Façade supporting structure;

lii. SS railing at both ends;

liii. Detailed Design and engineering of all Architectural works (Front of House (FoH) and Back of House (BoH) in public and non-public areas which includes Concourse, Platform, Foot over Bridge (FoB), Entry / Exit, plaza area, roof sheeting; system rooms, masonry / block-work walls,

mullions, tie beams, lintels, plastering including all Façade works including the required supporting structural elements etc., as approved by the Employer / Engineer.

liv. Signages design for all the stations

lv. Any other designs as needed for safety & operation regulations not covered above.

15.2.10 Some of the major utilities which cannot be diverted, the Contractor shall take into consideration the existence of these utilities and design the foundation at these locations accordingly, if required, the pile cap top level shall be fixed at the bottom of the utilities without any extra cost.

15.2.11 Deleted

15.2.12 Any other item of work as may be required to be carried out for completing the construction and commissioning of station buildings with all necessary interface works with other contractors in all respects in accordance with provision of the contract and to ensure the structural stability and safety during and after construction and commissioning.

15.3 Deleted

15.4 Clearances, Investigations and Reinstatement

15.4.1 The Permanent Works shall not infringe the IR / Metro railway Structure Gauge as confirmed by the project Schedule of Dimensions (SOD).

15.4.2 The Permanent Works shall allow for provisions for the installation of IR / Metro railway operating equipment without infringement of the structural gauge as confirmed by the project Schedule of Dimensions (SOD).

15.4.3 The Contractor shall request the Engineer's approval prior to demolishing any building or structure.

15.4.4 The Contractor is responsible to obtain No Objection Certificates (NOC) & Completion Approval for all utility and traffic diversions from the concerned Statutory Authority or utility Owner.

15.4.5 Prior to commencement of any traffic diversion the Contractor shall obtain No Objection Certificates (NOC) from the relevant Statutory Authorities/Stakeholder and the Engineer. The Contractor at all times shall minimise the impact of the Works on traffic flows. All traffic diversions, height clearances, road narrowing and any other restrictions shall be approved by the appropriate Authorities and the Engineer before work commences.

15.4.6 The Contractor shall carry out all reinstatement works to the satisfaction of all Stakeholders, Statutory Authorities and the Engineer.

15.4.7 The Contractor shall verify the survey information provided by the Employer/Project Partner. The Contractor's survey shall only be used for the basis of the design of the works. Any discrepancy found needs to be resolved before the commencement of work. The survey information shall be shared, verified and confirmed with other Project Partners.

15.4.8 The Contractor is advised to conduct further investigations considered necessary by them at their own cost. Any error or discrepancy found in the Employer's / Project Partners data at any stage will not constitute grounds for any claim for an extension of time or cost.

15.4.9 Contractor shall take necessary approvals from Statutory department like IR, DULT, BBMP, BDA, BMRCL and KRIDE.

15.5 Detailed Scope of Works

15.5.1 Stations as stated of each station to the limits shown on the Tender Reference Drawings.

15.5.2 The Contractor shall design & construct all the stations including but not limited to; foundations, piers/columns, concourse, platform, station entrances, lift & escalators shafts, roads, footpath, plazas, ancillary structures, entry / exit structures and FOB.

15.5.3 The Contractor shall carry out subsurface trial trenches to locate underground utilities for the

foundations.

15.5.4 The Contractor shall carry out geotechnical borehole soil investigation for foundation design at every pier/column location.

15.5.5 Deleted

15.5.6 The Contractor shall fully coordinate and interface their design and construction work with those prepared by Project Partners.

15.5.7 The Station aesthetics ("Look and Feel") have an impact on the passengers and general public. The architectural design principles shall include order and balance, proportion, simplicity, clarity or function, colour, form, texture, and how they complement each other. The principal aesthetic design factors shall fashion the visual basis upon which the balance of the appearance is built.

Principal Aesthetic Design Factors shall be;

a. Superstructure type and shape;
b. Vertical and horizontal geometry and their relationship to the surrounding environment;
c. Pier placement and shape to maximum sight lines;
d. Interaction between the station and its surroundings and environment;
e. The Station aesthetics shall showcase the heritage and culture and or history of the City.

15.5.8 (Deleted).

15.5.9 **The Stations**

a. The Stations shall be designed for multimodal integration including linkage to stakeholder properties and facilities as shown. The stations shall be designed for ease of passenger flow. The stations design shall ensure the essential satisfactory quality of the Station layout by providing adequate space for the systematic and organised movement of passengers from the ground level entrances to the concourse and then up to the platform areas and onto the train coaches. The stations shall be designed to ensure the security of the passengers and the facilities at all times.
b. The design and construction of all the station structures including supporting structure, foundation, columns, beams, slabs, staircases, parapets, canopies, gutters (Thickness 3.15mm min), RCC Water Tank (Underground and Overhead), Entry-Exit Structures, construction and integration FOB connection to existing Metro/IR as shown in tender reference drawings and other ancillary structures etc to the limits shown on the Tender Reference Drawings
c. The Contractor shall carry out geotechnical borehole soil investigation at every foundation location for the foundation (including pile) design.
d. All column foundations shall be designed and constructed as pile foundations. Where rocky strata permit, the Contractor may request the Engineer's approval to provide open raft foundations. Permanent liners, if required shall be provided.
e. Bore wells 2nos per station location (to meet the operational requirement) with submersible pumps of required capacity, Cables, starter and necessary connection in main panel at each station and connection with suitable dia. GI/UPVC line from bore wells to the underground water tanks with automated operation arrangement as approved by the Engineer.
f. Design and construction of lift shafts and escalator pits and other fixtures in station in coordination with respective system contractors including water proofing of lift pits and escalator pits as per specifications
g. Internal and External Water proofing in the underground structures, underground water tanks & overhead terrace tanks shall be with injection grouting, waterproofing plaster and finishing the tanks with Ceramic tiles.
h. Traffic crash barriers shall be provided to all piers, which shall include non-traffic roads.
i. Crash barriers shall be provided for Entry/Exit piers/columns which are adjacent to the Road

traffic.

j. The contractor shall maintain maximum stepping distance of 75mm at all stations platforms duly interfacing with other project partners (Rolling stock and track). If stepping distance exceeds 75mm, an alternative arrangement such as gap filler shall be provided. The material, specification, workmanship and methodology of the gap filler shall be approved by the engineer before execution.

k. For stations located over traffic roads protection installations shall be provided during construction to permit unimpeded traffic and pedestrian flow and damage to the Works. This protection shall be maintained until completion of all the station exterior finishing work. All working platforms shall be covered with suitable material to prevent any falls of equipment, materials and persons on to trafficked roads

The design, and engineering of Architectural Finishes & MEP Works

l. Detailed Design and engineering of all Architectural works (Front of House (FoH) and Back of House (BoH) in public and non-public areas which includes Concourse, Platform, Foot over Bridge (FoB), Entry/Exit, plaza area, roof sheeting; system rooms, masonry/block-work walls, mullions, tie beams, lintels, plastering including all Façade works including the required supporting structural elements etc., as approved by the Employer/Engineer.

m. MEP works in all stations and other station facility areas.

n. Water supply connections from Municipal Authority installations at all stations.

o. Clean and dirty water drainage connections to Municipality installations.

p. Public toilets at each station. The discharge shall be connected to the municipal sewage system and be in full compliance with the Authorities requirements. The Contractor shall fully coordinate and interface their drainage design and construction work with Project Partners.

q. Tack-up diesel generator rooms and generators at each station.

r. Design, Providing & Fixing of insert plates, bolts, support hangers for Systems and Façade.

s. The Contractor shall fully interface with Project Partner Contractors the size of System Technical rooms, all cut-outs, cable containment, corridors, earthing and Tetra and GSM tower requirements.

t. The Contractor shall ensure that installation routes are provided of sufficient size for the Project Partner Contractors proposed equipment. Rooms shall include as a minimum those shown in the Employer's reference drawings.

u. During design and Construction stage, interfacing issues between viaduct and stations within the Contract package and with the adjacent Contracts / Project Partners is to be fully coordinated. In case of any discrepancy, Engineer's decision will be final and binding.

15.5.10 Pre-Engineered Building (PEB) roof structure

Pre-Engineered Buildings or building components wherever specified shall be designed, supplied and erected by a specialist agency called PEB manufacturer approved by the Engineer. All codes and standards for material, design, fabrication and erection shall generally be as indicated for structural steel work unless the following specifications call for a deviation otherwise. PEB manufacturer shall use Submerged Arc Welding for built-up sections, meeting the applicable requirements of the American Welding Society (A.W.S) 01.1.98.

The agency responsible for design, fabrication and erection shall not be allowed to sub-let any of the activities/operations to another sub-agency in anyway unless a prior written approval of the Engineer is taken. The agency for PEB should have an ISO 9001 certification for manufacture of PEBs. The

Contractor shall submit all design drawings, shop drawings, erection drawings, fabrication design and drawings for approval by Engineer prior to commencement of fabrication works.

The work shall include:

i. Design, Fabrication, Supply and Erection of Pre-Engineered Building (PEB) roof Structure including roof sheeting with combination of polycorbonate sheet as per codal norms and as decided by Engineer/Employer for lighting over platforms and track way/rail level, Entry/Exits, FOB, any other structures including supporting columns, rafts, purlins etc., all complete including providing for "first fix" structural arrangement for Passenger Information Displays (PIDs), Clocks, Cameras, Signage, solar panels etc.,

ii. Design, fabrication, supply and erection of structural steel for roof inspection platforms, catwalks and cable tray support brackets & hangers.

iii. Providing lifeline for maintenance / cleaning purpose.

iv. Providing ladder to access roof and solar panel maintenance.

v. The Contractor or their sub-contractor must have their own fabrication unit with fully computerized and automatic machineries for cutting, bending, drilling, moulding, welding, grinding etc. with full flagged facilities of sand blasting, painting and testing equipment complete.

vi. All aspects of quality assurance, including procurement & testing of materials and other components of the work, as specified or as directed;

vii. Clearing of site and handing over of all the Works, closing of cut outs as directed;

viii. Maintenance of the completed Work during the maintenance period.

ix. The Contractor shall design and submit Design Drawings, Erection Drawings, Fabrication Drawings, completion (i.e. 'as-built') drawings, calculation, analysis and other related documents as specified;

x. The Contractor shall submit his design calculations and 'Engineering Drawings' to the Engineer for his approval. The contractor is advised to discuss his design philosophy and design procedure with the Engineer before proceeding with the final design work.

xi. The Contractor to obtain all relevant design information from the Engineer for preparing his designs, including all special loading like loads from cranes and other utility services supported by the structure.

xii. Shop drawings shall include, but not be limited to:

xiii. Detailed marking plans.

   a) Details of member connections and connections to other structures/ components of buildings.
   b) Detailed dimensions for fabrication indicating dimensional modifications required for field conditions.
   c) Welding and bolting procedures to be used both at shop and field.
   d) Cambers required to be provided, and permissible tolerances in fabrication.
   e) Assembly and erection sequences indicating components to be connected at field.
   f) Complete bill of materials for each component (preferably drawing wise).

xiv. All major Welding works shall be done at shop only.

xv. The contractor shall submit:

   a) Complete fabrication drawings, materials list, cutting lists, bolt lists, welding schedules and QC schedules, based on the design drawing furnished to him and in accordance with the approved schedule. It is highlighted that structural steel members, dimensions thereof indicated in tender drawings are tentative only, and may be modified during final design stage.
   b) Results of any tests, as and when conducted and as required by the Engineer.

c) Manufacturer's mill test reports in respect of steel materials, bolts, nuts and electrodes, wires as may be applicable.

d) A detailed list of all constructional Plant & Equipment, such as cranes, derricks, winches, welding sets etc. their makes, model, present condition and location, available to the contractor.

15.5.11 **The Mechanical, Electrical and Plumbing (MEP) Services.**

The Scope of MEP services shall include the design and Engineering of the proven E&M and Plumbing, Public Health Engineering (PHE) Works, supply of spares, training of O&M personnel and attendance during Defect Notification Period. The main item of the MEP works to be provided by this Contractor shall include but are not limited to following:

i. Power supply arrangements shall comprise of 33 kV/ 415 V cast resin dry type transformers (500/650 KVA) and associated incoming 33 KV feeders housed in an Auxiliary Substation generally located at concourse level of the Station. The auxiliary substations shall receive 33 KV feed from 33 KV cables installed along the guideway wall through loop-in/loop-out arrangement, and 415 V power shall be extended for various station utilities. The transformers (33 KV/415 V) and 33 KV switchgear shall be supplied, installed/ commissioned by the Contractor and this shall be interfaced by the two parties.

ii. The Contractor shall design a proven system for MEP works, meeting the requirement of standards, local municipal rules and application duty requirement including installation, operation, testing & commissioning of the system.

iii. The Contractor shall provide a power distribution system / Electrical Load Flow Schematic (with protection scheme) at 415 V and below including the LV/MV switchboards, main distribution boards, bus ducting, cabling, distribution and sub-distribution boards, feeder pillars etc. Power supply extension from the Main Distribution Board for Normal, Essential & Emergency loads shall be backed by a DG set and/or UPS.

iv. Submission of designs and calculation including software's and necessary documentation for review of the Engineer as per project requirement.

v. Electric supplies to various plant and equipment provided by the Project Partners, and this shall be interfaced.

vi. A sound attenuated Diesel Generator set at each station complete with automatic mains failure (AMF) panel and associated power distribution & change over panel.

vii. Station lighting, wiring and accessories including approach areas to the Station.

viii. Parallel redundant online UPS to feed emergency loads and power supply extension with associated control change-over panel.

ix. Automatic Power factor correction at supply point and major loads with associated control, distribution boards and protection.

x. Earthing System including Main Earthing Terminal and Clean Earth System for Systems Technical Rooms including provision of galvanised iron earth strips of adequate sizes to the earthing pits.

xi. Lightning protection system and Earthing for all the stations including provisions of structural arrangements in civil structure as directed by Engineer.

xii. Electrical insulation membrane at Station Platform edges.

xiii. Cable ducts/conduits/hangers/trays/cabling for power supply routing in the Station as per System & Project Partner requirements.

xiv. Fire Protection systems including detection, alarm and suppression etc. including obtaining required statutory approvals/clearance.

xv. Lifts and Escalators shall be provided by a Project Partner. Necessary provisions for structural

space, architectural finishes, provision of power requirement, supply and associated equipment and accessories shall be interfaced with the Project Partner and provided by the Contractor, and this shall be interfaced by the two parties.

xvi. Air-Conditioning and ventilation shall be provided in all Technical, Operation rooms and any other functional requirement rooms. The room environmental and humidity requirements for the Technical Rooms shall be interfaced with the Project Partners.

xvii. Station Building Automation System (BAS)/SCADA, including interface with Project Partners.

xviii. Water supply services, sewage system, drainage/sewage treatment & disposal system and other PHE services duly interfacing and coordinating with local parties/agencies.

xix. Rain Water Harvesting system at all stations (At least Two numbers each station).

xx. The Contractor shall design stations to confirm IGBC provision to meet Platinum rating. Station buildings shall be designed keeping the Employer's sustainability requirements.

xxi. The Contractor shall arrange the necessary provision for a Solar Photovoltaic System to be installed at each Station. The supply, installation, testing & commissioning of Solar Photovoltaic system (SPV) shall be provided by a Project Partner. The Civil contractor shall interface the design with the Project Partner.

xxii. Supply of Spares as per recommendation of OEMs for the MEP works.

xxiii. Interface with AFC, PSG/PSD, S&T, Rolling Stock, Solar Power and any other Contractors deployed on the Project (Project Partners) for their requirements as per interface matrix and Engineer's/Employer's directions.

xxiv. The Contractor shall apply, liaise and coordinate with the Local Authorities for all public utilities required for the Stations.

xxv. Automatic access to all system room doors

15.5.12 Logistics Areas

The Employer will not provide any land for logistics areas, casting yards or offices. The Contractor shall identify the land they require and procure the same at their own cost.

15.6 Design

15.6.1 A Designer or Designers shall be employed by the Contractor. The Designer(s) shall have relevant experience as defined in Qualification of Tenderer of Section-2 for designing of BSRP/IR/Metro Stations. The Contractor shall provide full details of the Designer(s) past experience and details of the proposed design discipline leads for the Engineer's approval.

The Contractor may propose to carry out the design work in-house if they have a design office with an experienced design team capable of carrying out the design work for this Contract. The in-house design team should have the relevant experience as prescribed above for the Designer. The Contractor shall provide full details of his design teams past experience and details of the proposed design discipline leads which he intends to deploy for the Engineer's approval.

To ensure progressive design assurance is achieved the Designer(s) discipline leads (including Key Personnel) shall be available at all times for design meetings and workshops with the Engineer and shall be located in Bengaluru.

15.6.2 The Permanent Works shall be designed and constructed in such a way that, when maintained in accordance with the Contractor's Operations and Maintenance manuals, the structures will remain serviceable for a minimum 100-year design life.

15.6.3 The Contractor shall develop their design and construction methodology to suit the areas provided for the Works including but not limited to the special design wherever needed on the stations, ramps and other locations.

15.6.4 The Works shall be designed to the Employer's requirements and all relevant current codes, specifications and drawings or as otherwise directed by the Engineer.

15.6.5 The design shall be fully coordinated for all disciplines including systems installations. The Contractor shall design all disciplines in a fully coordinated BIM 3D model to minimise clashes, which shall be shared with other Project Partner Contractors and Stakeholders, and this shall be carried out on a common digital platform to which the Engineer and other Project Partner Contractors will be provided access.

15.6.6 The Contractor shall appoint a proof check consulting agency (the "Proof Consultant") after proposing to the Engineer / Employer a panel of 3 (three) names of qualified and experienced firms and Engineer / Employer will select 1 Proof Consultant from panel. The Parties agree that no firm or person having any conflict of interest shall be engaged hereunder.

15.7 3D BIM requirements

15.7.1 BIM Employer's Information Requirements (EIRs) is in line with PAS1192-2:2013.

15.7.2 During the design stage the Contractor shall prepare the project BIM Execution Plan (BEP) which will provide a detailed account of how the deliverables stated in the EIR are to be achieved, each team member's responsibility and allocation of said deliverables according to discipline, for the Engineer's review.

15.7.3 The BEP should include the following sections in line with PAS1192-2:2013:

- Response to the EIRs
- Management processes
- Planning & Documentation processes
- Standard Method and Procedure (SMP)

15.7.4 Information Management

15.7.4.1 Level of Definition

Level of Definition (LOD) is used to determine both the level of geometry detail and Level of associated Information (LOI) for any given model element at the project work stage. Defining LOD and LOI informs the Contractor of the degree of information reliability when using the model.

15.7.4.2 Training Requirements

Training for access and operation of the Employer's CDE shall be provided by the Employer to the Contractor as required. Data security or induction requirements will be highlighted to the contractor on a project specific basis.

15.7.4.3 Planning of work and Data Segregation

This section is to set the management and modelling process requirement for the Contractor. Data segregation planning and information management responsibilities shall be in accordance with the process described inside PS 1192-2:2013. The following are required as a minimum and shall be documented in the project BEP:

- Naming Conventions
- Model Managements
- Volume, zones and areas
- Publishing Process

The Contractors 3D Model shall be the originating source for drawing productions. The Employer expects all Contractors to work in a collaborative manner utilizing intelligent 3D geometry models.

15.7.4.4 Co-ordination and Clash Deduction

Project quality and de-risking through the model and information co-ordination between various interfaces is a key Employer's objective and requirement.

Coordination meeting shall be conducted at least once in a week or 2-3 times in a month with the specialist/ representatives.

The Contractor shall ensure the availability of space and technical equipment for hosting the meetings, but all the contractor's specialists, sub-contractors and engineers shall be able to work during the meeting using their own portable hardware.

The clash detection and avoidance process shall be detailed in the project BEP. BEP shall include but not be limited to software utilization, responsibility assignment, outputs and clash resolution process. Delivery shall be undertaken through regular sharing of model data as outlined in the BEP in the form of native files and other agreed exchange formats. Prior to sharing, all data shall be checked, approved and validated as 'issued for coordination' in CDE in line with the BS 1192:2007 and PAS 1192-2:2013+A1 Status codes.

Model federation, coordination and reporting responsibilities shall align with the information exchange activities and roles outlined in PAS 1192-2:2013, Table 2.

15.7.4.5 Collaboration Process

The CDE for the project will be provided by the Employer. Details of the project collaboration process shall be fully outlined in the project BEP and should be sufficient to demonstrate competence and capability.

All processes must follow BS 1192:2007 & PAS 1192-2:2013, utilizing the described Common Data Environment (CDE) phases such as Work in Progress, Shared, Published and Archive during all project work stages.

The project CDE setup and management shall align with activities and responsibilities as outlined in PAS 1192-2:2013, Table 2

15.7.4.6 Common Data Environment Security

The project BEP shall set out the process for monitoring, managing and complying with the Employers security mandate, including adhering to any standard or process for data sharing.

All project information is to be treated with confidence and all models shall be exchanged in the CDE using agreed metadata tags. The project BEP shall demonstrate compliance processes and the means by which compliance is monitored and managed.

15.7.4.7 System Performance

The following shall be considered when developing the BEP:

- Model size – no size limitation but practically 200Mb max
- Software Uses – It is essential that the native file formats delivered can be openly shared and software platform systems can export to IFC2x3 format for information extraction, verification, archive and free model viewing purposes. Inherent model data must be extractable in a format exchangeable with Microsoft Excel for information exchange purposes.

15.7.4.8 Compliance Plan

A methodology for model delivery and data compliance procedures including references to standards and compliance software should be outlined in the BEP as a response. As a minimum reference should be made to

- Quality Assurance/ Control procedures
- Associated software
- Security requirement assurances

The Employer/ Engineer's Information Manager shall be granted access to the Contractor's CDE to enable regular compliance monitoring and audits.

15.7.4.9 Geospatial Coordinates

Models of all disciplines shall be in geospatial coordinate system. General considerations that need to be incorporated are as follows:

- All Models (2D/3D) should be created with the geospatial project origin and orientation using a conventional Cartesian axis and common unit of length.
- Model should be created at 1:1
- Units should be SI unit of measure.
- The accuracy achievable using the chosen units and origins shall be checked by the contactor according with the chosen Authoring tool.

15.7.4.10 Software Platforms

The below table shows the Building Information Model as well as other software Platforms to be used:

Software formats	
Method of Data exchange	Employer CDE
Format of 3D Graphical Data Exchange	IFC2x3, native and NWC, any other required format.
Format of 2D Graphical Data Exchange	PDF, Auto Cad and any other
Non-Graphical Data	IFC2x3, XLSX and any other
Documentation	PDF and any other

The ability of the contractor to use these platforms should be identified in the BEP.

15.7.5 Commercial Management

15.7.5.1 Information Exchange

At a project level, the frequency of required information exchanges shall be defined in further detail within the project Master Information Delivery Plan (MIDP). Whilst information can be shared at any time during a stage, formal published information deliverables should be exchanged prior to the end of a stage to advise the decision gateways, as indicated by the project MIDP.

Information deliverables required at each information exchange shall be as defined by the project MIDP. Those information deliverables range from files that may consist of any of the following:

- Native and PDF documents
- 3D Models – in their native discipline (un-federated) and in open standard IFC (International Foundation Clause) format.
- 2D Drawings – cut from the 3D models.
- Other documents in PDF, any other format required.

15.7.5.2 Roles and Responsibilities

The allocation of roles should be noted within the project BEP (Break Even Points) derived from PAS 1192-2:2013. The roles are not new appointments, rather roles that are applied to named individuals working on the project to assign task ownership. These roles may be transferred and migrated to different individuals as the project progresses.

The following roles in connection with BIM will be taken on directly by the Contractor:

- BIM Manager
- BIM Coordinator
- Technical Lead – BIM (one for each discipline)
- BIM Engineer / Specialist (one for each discipline)

15.7.5.3 Standards and Guidance

The core documents and standards that are mandated to be used on the project are:

- PAS 1192-2:2013
- PAS 1192-3:2014
- BS 1192-4:2014

- PAS1192-5: 2015
- Supported by BS 1192:2007

15.8 Interface and Coordination

15.8.1 The Contractor shall to the satisfaction of the Engineer, coordinate, interface and cooperate with all Stakeholders and Project Partners including all external Agencies and Authorities.

15.8.2 The Contractor shall fully co-ordinate the design and construction of his Works with Project Partners, but not limited to Viaduct, Track, Solar Panel, Depot, Rolling Stock, Signalling and Telecommunication, Automatic Fare Collection (AFC), Passenger Screen Doors (PSD) and Vertical and Horizontal Transportation Systems (VHTS).

15.8.3 The Contractor shall include and cooperate and coordinate by provision for the Project Partners equipment movement and installation by providing suitable access routes, staircases, cut/box outs, sumps, service corridors, cable troughs on the station area, raceways, conduits, fixtures, inserts, clearances etc.

15.8.4 Earthing and lightning protection shall be provided and fully coordinated with Project Partners.

15.8.5 The track supporting structure will support ballast less track (long welded rail) which will be laid later by a separate contractor. Arrangements of inserts/ dowels required for provision of such ballast less track will have to be incorporated in the deck in consultation with the Engineer where the ballast less track concrete is to be laid at the top of the deck slab by Track Contractor.

15.8.6 Prior to the Taking-Over Dates, early agreed access shall be provided to other Project Partners appointed by the Employer, to carry out their works. Material and equipment supply delivery routes shall be coordinated and provided to the Project Partners. The security of materials and equipment brought to the site by other Project Partners shall be their responsibility.

15.8.7 The Contractor shall conduct and coordinate interface meetings intimated to the Engineer, and adhere to the decisions taken at the meeting approved by the Engineer.

15.8.8 Any coordination or interface disagreements with other Project Partners shall be informed to the Engineer. If the Contractor despite having taken all reasonable efforts cannot resolve such disagreements, then the decision of the Engineer shall be final and binding on the Contractor.

15.8.9 Access shall be provided to the staff and labour of the other Contractor appointed by the Employer for carrying out their works and bringing materials and equipment at the site. However, the security of materials and Equipment brought at the site will be the responsibility of the respective Contractors.

15.9 Utility Diversions

15.9.1 Utility identification at foundation locations shall be carried out by the Contractor in advance. The Contractor shall modify the reference structural design confirmed in the Tender Drawings to save the utilities as directed by the Statutory Authority within the accepted Lump Sum price. The relocation/diversion of the utility shall be undertaken by the contractor. The removal/diversion plan shall be approved by the Utility owning agency.

15.9.2 The Contractor shall be responsible for design, diversion plan, getting approval, co-ordination and supervision of execution of works pertaining to relocation/shifting/removal of above and below ground utilities, through respective Utility agencies. The payment for these Items will be made under Schedule 'C'. The Contractor will be entitled for payment for co-ordination and supervision charges for the executed works as defined in the Pricing Document (Section-9). Any delay in completion of these works shall not relieve the Contractor's obligation and it shall be at Contractor's own risk and cost.

15.9.3 Utility services that may require removal/diversion or protection while carrying out the scope of work under this Contract may include, but are not be limited to gas, electricity, telecommunication cables (including fibre optic), military and security, police utilities, medical utilities, sewage and storm water

etc,.

15.9.4 The diversion of overhead and underground electric transmission lines above 33kv shall be arranged by the Employer directly through the utility owning Agencies/ statutory authorities and shall be paid directly by the Employer.

15.9.5 Tree cutting, relocation, Afforestation and plantation shall be carried out as per **Annexure -3** of Employer's Requirements. However, grass, lawn, herbs, shrubs, plants, and others which are not to be transplanted/removed by the owning agencies shall be removed by Contractor.

15.9.6 The Contractor shall ensure that any salvage materials are returned to the utility owning agencies.

15.9.7 The demolition, dismantling and disposal of building structures such details will be advised progressively during the progress of the Contract work and the cost towards the same is deemed to be included in the Schedule 'A'.

15.9.8 Any incidental and unforeseen works under this Contract shall also be deemed to be included in the Schedule 'A'.

15.9.9 The Contractor shall remain responsible for any works carried out by his Subcontractor, Vendors, Utility owning agencies within the right-of-way and/or the construction site boundaries.

15.9.10 Utility Diversions include but are not limited to the following scope of work:

a. Verify the correctness of all drawings showing utilities provided by the Employer, Engineer and Statutory Authorities;
b. Relocation/diversion of utilities as deemed necessary, and agreed by the Engineer, to enable the execution of the Works;
c. Construction of temporary traffic diversions where the construction of the works for the utility diversion interrupts existing public or private roads or right of way;
d. Provision and submission to the Engineer and Statutory Authorities of AutoCAD drawings and diversion construction methodology showing details of the utility locations and depth before and after relocation, supported by photographs; and
e. Protection of utilities that are not to be diverted during the execution of the Works as per the Employer's Requirements.

15.9.11 In the process of either identifying, relocating or protecting the public utility services located within the right-of-way and/or the construction site the Contractor shall:

a. Obtain all necessary approvals (NOC) from the relevant authorities to carry out the investigations to identify the location of all existing public utilities within the right-of-way and/or the construction site boundaries;
b. Provide accurate records of existing public utilities identified to the Engineer, prior to commencement of the Works;
c. Provide accurate records of any additional public utilities encountered and take all necessary steps to prevent damage to and to safeguard such services;
d. Draft any utility diversion design plan in accordance with the applicable standards as approved by the relevant Statutory Authorities;
e. Cooperate with any other Stakeholders involved so as to avoid interference with other Project Partner Contractor operations e.g. an independently appointed Enabling Works Contractor;
f. Cooperate with the public utility authorities to safeguard and minimise the disruption of service;
g. Erect suitable barricades around all trenches dug during utility identification or diversion (this is deemed to be part of the Lump Sum Schedule A cost);
h. Construct temporary traffic diversions where the construction of the works interrupts existing public or private roads or right of way but only after first obtaining approval from the relevant authorities;
i. Prepare shop drawings, approved by the relevant authorities and the Engineer, before commencing any diversion of utilities;

j. Construct support and/or protection, as approved by the Utility Authority and Engineer, for those utilities that do not require diversion during construction;

k. In the event of a service being interrupted as a result of damage caused by the Contractor or Subcontractor, promptly notify the authority concerned and inform the Engineer of the incident. The Contractor shall be responsible for all costs for damage repairs that are required to restore the services and any consequential damages;

l. Ensure that adequate insurance cover is in place at all times, as approved by the Engineer, to cover all liabilities that may result as a consequence of accidental disruption of any utility service;

m. Make substitute arrangements, as directed by the concerned Utility Authority, until such time that any damage caused to utility services by the Contractor or Subcontractor has been repaired at the Contractors own expense; and

n. Submit a copy of all 'As-Built Drawings' to the relevant authorities and Engineer and obtain a completion certificate from the relevant service authority once of the awarded works related to removal, utility diversion, relocation and protection have been completed.

15.9.12 The Employer retains the right to select and appoint the party responsible for carrying out the Utility Diversions scope of work, either in its entirety or to allocate certain parts of the scope of work.

15.10 Project Time Requirements

15.10.1 Please refer to Contract Data at Annexure 1 to Part A of Section-6 for Key Dates with reference to the Commencement Date (CD).

Appendix – I - Programme Requirements

1.1 General

Construction Programme and project monitoring

I. The contractor shall propose and submit his detailed construction program separately and as per the procedure detailed in the scope of work. Contractor may be asked to schedule and complete the work block wise / area wise in a phased manner fixing priorities to different stretches of the work to give access to other interfacing contracts as mentioned in the Bid documents.

II. The tentative construction program shall be submitted within the period as specified in the Bid document for approval of the Engineer as 'Baseline Program'. The base line program shall clearly reflect interface and access dates for other civil/ system-wide contracts. The basis of the time schedule for each activity such as productivity of man and machines and time cycle of each activity and resource planning shall be submitted along with the base line program.

1. After the work has started, the Contractor shall deliver in the first week of every month to the Engineer an update of the Construction Program showing changes, if any, in planning or progress scheduling and reflecting the progress of all the activities of the network and the project status as at the end of previous month.
2. If the Contractor falls behind the approved Construction Program by more than one month, he shall, within fourteen days of the date of such information, submit for approval, a revision of the construction program showing the proposed measures, including augmentation of plant, labor and material resources to complete the works on time.
3. Whenever the Contractor proposes to change the construction program, he shall immediately advise the Engineer in writing and, if the Engineer considers the change a major one, the Contractor shall submit a revised program for approval.
4. Detailed Network Plan (Works Program): Detailed Network Plan shall be prepared by the Contractor for each and every activity within the same time frame and in the same sequence. Activity at this level shall not be more than 15 days' duration, except for summary items like procurement/ mobilization etc.

III. The Contractor shall select a PC-based broad planning and control software (licensed version of Primavera, M.S. Projects etc.). The two networks shall be implemented on works as detailed in the Scope of work. The Contractor shall supply one original licensed copy of the software selected including manuals and any subsequent versions thereof at no extra cost along with the Baseline program network and detailed network plan and load it on the PC system of the Engineer so that uniform monitoring of the project is done and any slippages are identified well in time and corrective action taken. The contractor shall also arrange suitable training of the personnel of Engineer on the selected software, if required, at no extra cost.

IV. The following reports, in agreed formats and frequency, shall be submitted by the Contractor at his own cost:

i. Progress Reports
ii. Material Status Reports
iii. Equipment and Manpower Deployment Reports
iv. Any other Report desired by the Employer or the Engineer

V. The Engineer's monitoring team will have access to all the data/information of the Contractor, required for the assessment of the progress and monitoring. If necessary, the monitoring team will visit the Vendor/Contractor's works in order to assess the status of critical activities.

VI. Periodic Project Status Review Meetings will be held by the Employer or the Engineer. The Contractor shall depute his Engineers/Managers at appropriate level as decided by the Engineer to attend the Review Meetings.

VII. Progress photographs of the major events shall be submitted by the Contractor along with the Progress Reports. Video Recording of the progress of works shall be maintained from beginning till completion of work as directed by the Engineer.

VIII. The Contractor shall provide additional inputs whenever the PERT-CPM/ network diagram (Primavera/ MS Projects) indicates a possible slippage in the completion schedule. Such additional inputs may require supplementing of equipment, personnel, work in excess of the normal work per day, and work in excess of the normal work per week or other resources. Provisions in the relevant Clause of Conditions of Contract and Perticular of conditions of contract will be applicable in cases of delays due to Contractor.

1.2 Purpose of Program

a) The purpose for the requirement of Program (Scheduling) information described in this document is to provide the Engineer with status reports for managing, monitoring and coordinating the awarded contract during the execution within the overall multi-contract project schedule. It describes a series of reports to be submitted by the Contractor to the Engineer during the execution of the contract, following the award of Contract.

b) The Bidder/ Contractor shall program his work at all times to meet the Key Dates and the Works Area Hand-over Dates specified in the bid documents and the specified interface periods for the design and installation of the Works with those of the Designated Contractors and shall during the progress of the Works constantly monitor his progress against the programs described below.

c) The Bidder/ Contractor shall include in all programs his work obligations towards shared access, shared Site areas and other coincident or adjacent Works Areas.

d) The Works Program, and all more detailed or revised versions, shall be submitted to the Engineer for his consent.

1.3 Methodology

a) The computerized MSP / Primavera network using the Precedence Diagramming Method (PDM) has been selected by the Employer as the technique for contract management system and in coordinating the multi-contract project. This technique shall also be employed by the Bidder in preparing their Bid submissions and by the Contractor in their Construction Stage submissions.

b) Unless otherwise agreed by the Engineer, all programs submitted by the Contractor shall be produced using computerized MSP / Primavera Networks developed implementing the Precedence Diagramming Method (PDM) with Resource Loaded Charts and Tables.

c) The Contractor shall implement and use throughout the duration of the Contract, a computerized system to plan, execute, maintain and manage the planning, design, pre-construction, construction, and sub-contracts in executing the MSP / Primavera scheduling by PDM. The reports, documents and data shall be provided monthly and shall be an accurate representation of the current status of the Works and of the work remaining to be accomplished; work planned to be taken up during next month, shall provide a sound basis for identifying problems, deviations from the planned works, and for making decisions; and shall enable timely preparation of the same for presentation to the Engineer.

d) Program management software
MSP / Primavera programming software used shall be Primavera 6.0 v 21.12 programming software shall be used.

1.4 Submissions

1.4.1 The Contractor shall develop bid Program into the Initial Works Program including an outline Narrative Statement and submit within 28 days of the date of receipt of Letter of acceptance and its more detailed version within 15 days of receiving the Engineer's consent to the proposed Initial Works Program.

1.4.2 Activities in the initial works program should be arranged as per the Works Break down Structure (WBS)

of the work. The WBS of the work would be developed by the contractor in consultation with the Engineer. Contractor would get the WBS approved by the Engineer and the program expert.

1.4.3 The first Three Month Rolling Program shall also be submitted along with Initial Works Program within 28 days of the date of receipt of Letter of Acceptance and all subsequent editions shall accompany the Monthly Progress Report. The Monthly Progress Reports shall also include a Program Update as described below. These programs shall subsequently be updated as described below.

1.4.4 Following the Engineer's consent to Contractor's Initial Works Program submission, the contractor shall make submissions of the Detailed Works **Program** suitably amended to take into account the programs of Designated Contracts. It is the Contractor's responsibility to ensure timely co-ordination with the Designated Contractors to review, revise and finalize his Initial Work Program so as not to affect the progress of Works/ and or the works of the Interfacing Contractors. The resubmitted program when approved by the Engineer and the program expert shall form the **Baseline Program** against which actual progress of the Contract shall be reckoned. As the work progresses, it may be necessary to update/ revise the Baseline program but such updating shall only be carried out with the prior consent of the Engineer or when directed by them.

1.4.5 For Initial & Detail Work Program submission, one (1) original and six (6) copies each (along with electronic copy) of the following Programs and Reports shall be submitted to the Engineer:

a) Program: Baseline MSP / Primavera Network
b) Program: Baseline Milestone based Cost Activity Schedule
c) Baseline Schedule Report
d) Narrative
e) Baseline Physical Progress 'S' curve
f) Baseline Resource Charts (with Resource levelling)
g) Detailed Method Statement

1.4.6 The Engineer shall review and comment on the Contractor's programs and information submitted. The Engineer will confirm his consent or otherwise of the submissions.

1.4.7 The Engineer shall require the Contractor to re-submit within fifteen (15) calendar days if he is of the opinion that the programs and information submitted by the Contractor is unlikely to meet the Contract key dates.

1.4.8 If in the opinion of the Engineer, any of the Contractor's revised programs or Baseline Schedule Report is not acceptable, it shall be construed as a failure of the Contractor to meet a Milestone.

1.4.9 Notwithstanding the above, the Engineer may at any time during the course of the Contract require the Contractor to reproduce the computer-generated Baseline Schedule Report described above to reflect actual activity dates and generate schedules based upon "what if" statements. The initial computer-generated report after receiving the Engineer's consent will serve as the base against which the contract progress will be measured. Any changes to the Report reflected in subsequent Baseline Schedule Reports shall also require the Engineer's consent.

1.4.10 Failure to include any element of work required for performance of the Contract shall not relieve the Contractor from completing all works required under the Contract to achieve the original or any extended key completion date.

1.5 Works Programme

1.5.1 The Works Programme shall show the Contractor's plan for organizing and carrying out whole of the Works.

1.5.2 The Works Programme shall be a computerized MSP / Primavera network developed using the Precedence Diagramming Method (PDM) and shall be present in bar chart and time-scaled network diagram format to a weekly time scale.

1.5.3 Tasks in the Works Programme shall be sufficiently detailed to describe activities and events that include, but are not limited to, the following:

(a) Key Dates, and Works Area Hand-over Dates and Interface dates.
(b) All physical work to be undertaken in the performance of the Contract obligations, including Temporary Works,
(c) The requested date for issue of any drawings or information by the Engineer,
(d) Procurement of major materials and the delivery and/or partial delivery date on-Site of principal items of Contractor's Equipment,
(e) Commissioning date of Contractor's major equipment
(f) Any off-site work such as production or pre-fabrication of components,
(g) installation of temporary construction facilities,
(h) Interface periods with Designated Contractors or utility undertakings,
(i) Design, supply and/or construction activities of sub-contractors,
(j) Any outside influence which will or may affect the Works.

1.5.4 The Works Programme shall show achievement of all Key Dates, Interface dates and Works Area Hand-over Dates. The Works Program shall also show all Milestones, but the Milestones shall not be taken as imposing any constraints that in any way affect the logic or limit any other dates in the program.

1.5.5 Activity descriptions shall be unique, describing discrete elements of work. Any activity creating an imposed time or other constraint shall be fully defined by the Contractor.

1.5.6 The Works Programme shall be organized in a logical work-breakdown-structure including work stages and phases, and shall clearly indicate the critical path(s).

1.5.7 Activity duration shall not exceed 15 days, unless otherwise consented to by the Engineer, except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment and concrete curing. The Contractor shall submit a Program/Project Calendar cross reference clearly indicating the allowance for holidays.

1.5.8 The Works Program, in each submission, shall be accompanied by an Activity Report and a Narrative Statement as described below in both electronic and hard copy format (time scale logic diagrams in A1/A3 size, reports in A4 size).

1.5.9 Activity Report shall list all activities, and events in the Works Program, sorted by activity identification number.

The Activity Report shall include the following for each activity and event:

i. Activity identification number and description,
ii. Duration expressed in Days,
iii. Early and late start & early and late finish dates. Planned start and finish dates,
iv. Calculated total float and free float,
v. Predecessor and successor(s), accompanying relationships and lead/lag duration,
vi. Imposed time or date constraints,
vii. Calendar.

1.5.10 Narrative Statement

The Narrative shall be a comprehensive statement of the Contractor's plan and approach for the execution of the Works and the achievement of key dates, handover dates, submission dates and any intermediate dates. It shall incorporate outline method statements in respect of major items of work including construction sequences, launching scheme, resources required including primary item of plant, Construction Equipment required, person responsible, quality checks, inspection and test procedures, tolerances, Temporary Works and the like, risk analysis, etc. for carrying out that activity. It shall fully explain the reasons for the main logic links in the Program and include particulars of how activity duration is established. This shall include estimated quantities, production rates, hours per shift, work days per week and a listing of the major items of Construction Equipment planned for use on the project. Activities, which may be expedited by use of overtime or additional shifts, shall be identified and explained. A listing of holidays, and other special non-work days being used for the computer reports shall be included.

1.5.11 Baseline Physical Progress 'S' Curve

The Contractor shall also submit a forecast Cumulative Physical Progress 'S' curve based on the time-phased distribution of cost in the MSP / Primavera Network Logic Diagram, expressed in percentage terms. This 'S' curve shall be generated from the computerized MSP / Primavera Network Logic Diagram.

1.5.12 Baseline Resource Charts

The Contractor shall also submit a Resource Charts, generated from the Contractor's MSP / Primavera Network Diagram, showing the anticipated manpower and main Construction Equipment usage during the execution of the Project. The Resources shall be properly levelled using primavera VP6 software.

All submissions of proposed Works Programs subsequently, after approval of the Initial Works Program, shall include the actual physical progress of work and forecast of the remaining work. Actual progress shall be stated in percent complete, remaining duration, and actual start and finish dates for each activity in the Works Program.

1.6 Initial Works Programme

1.6.1 The Initial Works Programme submitted as under Clause 1.4.1 need not include the full details given under Clause 1.5 above. It should be a condensed version with combined activities of longer duration but must show clearly how the requirements of the Contract are to be achieved. Activities in the initial works program should be arranged as per the Works Break down Structure (WBS) of the work. The WBS of the work would be developed by the contractor in consultation with the Engineer. Contractor would get the WBS approved by the Engineer. The outline Narrative Statement shall be in sufficient detail to clearly show the Contractor's intention.

1.6.2 Within 15 days of the Engineer's consent to the Initial Works Program, the Contractor shall submit to the Engineer an expanded and more detailed version of the Initial Works Program containing all of the information and detail required under Clause 1.4 and 1.5 above.

1.6.3 Such submission shall make use of the Program submitted earlier but refined to include the best estimates of dates for the work of Designated Contracts which has impact on the Contractor's program. Such programs shall be amended subsequently to incorporate the actual dates/ schedule of the affecting contracts. It is the Contractor's responsibility to ensure timely co-ordination with the Designated Contractors to finalize the Initial Program, without affecting progress of the work.

1.7 Works Programme Revisions

1.7.1 The Contractor shall immediately notify the Engineer in writing of the need for any changes in the Works Program, whether due to a change of intention or of circumstances or for any other reason. Where such proposed change affects timely completion of the Works or any other Key Date the Contractor shall within fourteen (14) days of the date of notifying the Engineer submit for the Engineer's consent its proposed revised Works Program and accompanying Narrative Statement. The proposed revised Works Program shall show the sequence of operations of any and all works related to the change and the impact of changed work or changed conditions.

1.7.2 If at any time the Engineer considers the actual or anticipated progress of the work reflects a significant deviation from the Works Program, he may request the Contractor to submit a proposed revised Program which together with an accompanying Activity Report and Narrative Statement, shall be submitted by the Contractor within fourteen (14) days after the Engineer's instruction. The proposed revised Works Program shall show the sequence of operations of any and all work related to the change and the impact of changed work or changed conditions. Revisions should not affect the overall completion of the project.

1.7.3 All activities that have negative float must be analyzed by the Contractor to identify the impact on the timely completion of the Works or on the achievement of Key Dates.

1.8 Three-Month Rolling Programme

1.8.1 The Three-Month Rolling Programme shall be an expansion of the Detailed Works Program, covering sequential periods of three months. The Three-Month Rolling Program shall provide more detail of the Contractor's plan, organization and execution of the work within these periods. In particular, the Contractor shall expand each activity planned to occur during the next three (3) month period, if necessary, to a daily level of detail.

1.8.2 The Three-Month Rolling Program shall be developed as an MSP / Primavera network, and shall be presented in bar chart and time-scaled network diagram format. Bar charts shall be presented on an A4 and time-scaled networks diagrams on an A3 size reproducible media. Tasks in the program shall be derivatives of and directly related to tasks in the approved Works Program.

1.8.3 The Contractor shall describe the discrete work elements and work element inter-relationships necessary to complete all works and any separable parts thereof including work assigned to sub-contractors within the contract period.

1.8.4 Activity duration shall not exceed two (2) weeks unless and otherwise consent of Engineer is granted.

1.8.5 Each activity in the Three-Month Rolling Program shall be coded, or described so as clearly to indicate the corresponding activity in the Works Program.

1.9 Three-Month Rolling Programme Revisions and update

1.9.1 The Three-Month Rolling Programme shall be extended forward each month as described under Clause 1.8.1 above. Each submission of the Three-Month Rolling Program shall be accompanied by a Program Analysis Report, describing actual progress to date, and the forecast for activities occurring over the next three-month period in order to achieve progress as per the approved Works Program.

1.9.2 If the Three-Month Rolling Program is at variance with the Works Program, the Program Analysis Report shall be accompanied by a supporting Narrative Statement describing the Contractor's plan for the execution of the activities to be undertaken over the three-month period, including program assumptions and methods to be employed in achieving timely completion.

1.9.3 The Contractor shall revise the Three-Month Rolling Program or propose revisions of the Works Program, or both, on a monthly basis to ensure consistency between them.

1.9.4 Three-Month Rolling Program (revised) to be submitted on a monthly basis by 5th of every month with respect to the progress achieved by the last day of the previous month. A penalty of ₹. 100,000/- (Rupees One Lakh) per instance will become applicable to the contractor for non-submission of the revised Three-monthly rolling program as per above clauses, irrespective of the causes lead to variances if any and the penalty will be deducted in the subsequent IPC which will be non-refundable.

1.10 Weekly review

Once a week, on a day mutually agreed to by the Engineer and the Contractor, a meeting will be held to assess progress by the Contractor during the previous week, progress review which will also be attended by the programs Expert and the Contractor's Program Engineer. The Contractor shall submit a construction schedule listing activity completed and in-progress from the previous week and the activities scheduled for the succeeding two weeks based on the detailed Works Program. Copies of the schedule shall be submitted on A3 sized papers.

1.11 Project Calendar

For the Project, the Contractor shall adopt 7 days a week calendar, identical calendar for the purpose of programming and Execution of Works. Official documents shall be transacted during 6 days' week – Monday through Saturday. For Project purposes, a week begins at 0001 hours on a Monday and ends at 2359 hours on a Sunday. The completion of an activity or the achievement of an event when given a week

number shall be taken to mean midnight on the Sunday at the end of the numbered week. An access date or activity start date when given as a week number shall be taken to mean 0001 hours on a Monday of the Numbered week.

1.12 Programming Personnel

The Contractor shall submit, as part of its Staff Organization Plan, the names and required information for the staff to be employed on Works Programming. The principal Works Programmer shall hold reputable professional qualifications acceptable to the Engineer including at least five (5) years relevant experience in programming civil engineering works. Others in the group shall have at least three (3) years' experiences in such work. The programmers shall be employed by the Contractor full time on the Contract until the completion or such earlier time the Engineer may give his consent.

1.13 Programme and Report Submission Format

The Contractor shall submit one (1) original and six (6) copies and one (1) reproducible (for Programs) of all submissions to the Engineer. All submissions shall be in A0, A1, A3 or A4 size, as appropriate except as may otherwise be agreed by the Engineer. In addition, the computerized program and report shall be submitted in compatible discs. The format for all Program and Report submissions shall be strictly in accordance with the format as stated herein or as requested by the Engineer.

2. Monthly Progress Reports

2.1 General

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 below.

2.2 Physical Process

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

2.3 Programme Update (For Entire Project)

Programme updating shall include

(a) 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:
   (i) Early Work and Baseline Submittals – explains determination of activity duration and describes the Contractor's approach for meeting required Key Dates as specified in the Contract.
   (ii) Updated Detail 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 Programme indicates an actual or potential delay to Contract Completion date or Key Dates, identify causes of delays and provide explanation of Work affected and proposed corrective action to meet Key Dates or mitigate potential delays. Identify deviation from previous month's critical path.

- Identify by activity number and description, activities in progress and activities scheduled to be completed.
- Discuss Variation Order Work Items, if any.

(b) The Program Status which shall: -
(i) Show Works Program status up to and including the current report period, display Cumulative progress to date and a forecast of remaining work.

(ii) Be presented as a bar-chart size A3 or A4 and as a time-related logic network diagram on an A1 media, including activity listings;

(c) The Activity Variance Analysis which shall analyze 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.

2.4 Three Month Rolling Program

The monthly issue of the Three-Month Rolling Program.

2.5 Financial Status

It should include following

a) A narrative review of all significant financial matters, and actions proposed or taken in respect to any outstanding matters.
b) A spread sheet indicating the status of all payments due and made.
c) A status report on status of extra items, if any

2.6 Status of Claims

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

2.7 Milestones/Key Dates Status

A report on the status of all milestones/ key dates due to have been achieved during the month and forecasts of achievement of any non-achieved key dates and those due in the next month

2.8 Resources Status

2.8.1 The Contractor shall submit to the Engineer each month a detailed list by trade classification, of manpower employed during the report period, stock of all major construction materials as also a list of all serviceable major items of construction plant and equipment on site including those which are proposed to be mobilized during the next month.

2.8.2 A report on the status of deployment of all key personnel and other manpower by trade Vis – a - Vis their deployment schedule and explaining constraints if any.

2.8.3 Status of stock of all the major construction material vis -a- vis its requirements for next month.

2.8.4 Status of all serviceable major construction plant and equipment at site.

2.9 Procurement Report

2.9.1 A summary of all significant procurement activities during the month, including reasons of delay (if any) and action taken to overcome problems.

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

(a) purchase Order Date – Scheduled/ Actual,
(b) manufacturer/ Supplier and Origin,
(c) letter of Credit Issued Date,
(d) manufacturer/ Supplier Ship Date – Scheduled/ Actual,
(e) method of Shipment,
(f) Arrival Date in India – Scheduled/ Actual.
(g) Arrival date at site and commissioning date

The report should also explain the delays (if any) in arrivals of the major equipment at site and the actions taken by the Contractor to expedite the same and the measures proposed to makeup the time loss.

2.10 Production and testing

It should include following:

(a) A review of all production and manufacturing activities during the month.
(b) Summaries of all production and manufacturing outputs during the month together with forecasts for the next month.
(c) Review of all testing activities (both at site and at the manufacturer's premises) during the month.

2.11 Safety

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

2.12 Environment

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

2.12.2 In case of failure of the Contractor to make submissions as per section 1.4 herein above, the Employer/ Engineer shall retain 5% of the due progress payment till the submissions. For non-submission of Monthly Update and Progress Reports as per Clause 2 herein above, the Employer/ Engineer shall retain 5% of the due progress payment in each case, which shall be released upon submission of the same. In case the submissions are not made in the month it is due, the retained payment would be released only in the next Monthly Running Bill.

Appendix – II - Method of Measurements for Permanent Works

1 Introduction

1.1 The detailed procedure to be followed for the recording of measurements and for the preparation and passing of Contractors Bills for permanent works is set out in the following paragraphs.

2 Measurement of Works

2.1 General

2.1.1 Measurements shall be taken at such intervals as are found necessary or convenient. Generally, one bill will be preferred in a month or as specified in the contract.

2.1.2 Entries should be made only in ink, and no entry should be erased or defaced so as to make it illegible. Correction of mistake, if any, shall be made by neatly crossing out the incorrect entry and rewriting and correct words or figures. All such corrections should be initialed by the Contractor's Engineer as well as by the Engineer's Representative at site.

2.1.3 Format of Record of Measurements sheets and procedure for issue of these measurement sheets shall be as decided by Engineer / Employer.

2.1.4 Before starting the earth work for embankment, cutting, bridge excavations etc., the initial ground levels shall be taken jointly along with engineer.

2.2 Items for which Good-for-Construction GFC Drawing is issued

2.2.1 As soon as the Good-For-Construction GFC drawing for a work is issued, the Contractor will calculate the details of quantities of various items of PRICE SCHEDULE involved, in a format approved by Engineer, and submit the calculations and schedule of quantities to the Engineer / Engineer's Representative and get them approved for the drawing.

2.2.2 Once the schedule of quantities is thus approved, the Contractor will submit five copies of the approved schedule to Engineer's Representative in an approved format.

2.2.3 The Contractor will submit his payment claims based on the approved schedule of quantities along with certification of actual work done as per specifications, drawings and contract conditions and within the tolerances as specified. Measurement will be entered in Record of Measurement Sheet duly signed jointly on each page by Contractor's authorized qualified engineer and Engineer's Representative.

2.2.4 Abstract of measurement will be prepared by the contractor in the approved form based upon these measurements.

2.3 Items for which Good-For-Construction GFC Drawing is not issued

2.3.1 For all such works, whose measurement cannot be calculated from any Good-For-Construction (GFC) drawing, all measurements will be taken by the Contractor's authorized qualified Engineer in the presence of the Engineer's Representative at site. These measurements will be recorded on approved form of Record Measurement Sheet and signed jointly by contractor and Engineer's Representative.

2.3.2 Contractor will ensure that a properly qualified Engineer is deputed for taking measurements and also that all the measurements taken are witnessed and signed by the Engineer's Representative.

2.3.3 All measurements should be recorded at site on the Record of Measurement Sheet in the presence of the Engineer's Representative.

2.3.4 Each Measurement Sheet should be signed by the Contractor's Engineer as well as by the witnessing Engineer's Representative.

2.3.5 Based on the recorded measurement contractor will prepare abstract of quantities in the approved format.

Appendix III - Quality Manual

Table of Content

2 Purpose

This document titled 'Construction Quality Guideline' sets the minimum Quality Standards that are to be adopted and implemented across all the projects of the BSRP project Programs. This document only provides an outline and overview of the obligations, the detailed and specific quality requirements are described in Indian Legislation.

3 Scope

a. This procedure applies to Bangalore Suburban Rail Projects and sub projects at BSRP, project information / records created regardless of format, which includes information generated by the General Consultant, D&B Contractor(s) and 3rd Parties.
b. KRIDE contracts complete packages. These packages consist in detail engineering, construction / production, quality planning, assurance and control and at last quality verification.
c. KRIDE requires the fulfilment of the KRIDE CMS Quality Policy, the quality objectives and the project quality plan(s) throughout the lifecycle of the contracted work

4 Definitions

Table 1: Definitions

Term	Definition
KRIDE	The Employer and Client
General Consultant	Bangalore Suburban Rail Projects' General Consultant (Egis, AECOM & WSP JV).
The Engineer	The Delegated Client Representative to administer the Contract
Initiator / Originator	The person who starts the process.
Participant	The person who is or may be involved in the implementation of the procedure.
D&B Contractor	The organization contracted by the Employer to carry out the Project D&B works.
3rd Parties	3rd party Project stakeholders.
Project Partners	The term 'Project Partners' used throughout this document includes the Client, General Consultant, other Consultants, Contractors, Subcontractor's, Suppliers and anyone else who undertake works on the Bangalore Suburban Rail projects.

4 Responsibilities

4.1 Project Directors

a. Provide positive leadership on quality issues.
b. Promote an enthusiastic quality culture that delivers positive commitment to and engages all employees in continuous improvement in quality performance.
c. Keep abreast of developments of Indian quality legislation and industry standards.
d. Ensure that a quality management system is implemented within their sphere of responsibility and monitor and review its effectiveness and take necessary improvement action.
e. Monitor that personnel under their control comply with their individual responsibilities in quality

matters.

f. Ensure that the disciplinary process to address breaches of the quality policy or management system is applied where necessary.

4.2 Senior Managers

a. Senior Managers are people in the organisation at any level above senior supervisor and below director.
b. Provide positive leadership on quality issues within their area of operation.
c. Promote an enthusiastic quality culture that delivers positive commitment to and engages all employees in continuous improvement in quality performance.
d. Implement the business unit quality management system. In particular:
   i. Identify quality training needs and have the necessary training arranged and when arranged, release those who require training.
   ii. Make arrangements for quality induction training for all new starters at the workplace under their control.
   iii. Implement operating procedures, for the planning and control of activities associated with identified risks.
   iv. Ensure that written method statements, risk assessments and/or quality rules are brought to the attention of management.
   v. Appoint appropriate personnel to undertake quality duties.
   vi. Ensure that suitable arrangements are in place for the effective control of changes to planned methods of work.
   vii. Keep abreast of developments in Indian quality legislation and industry standards.
   viii. Monitor and review the effectiveness of the quality management system and report deficiencies.
   ix. Monitor that personnel under their control comply with their individual responsibilities in quality matters.
   x. Give personnel under their control, including contractors, clear instructions as to their responsibilities to ensure correct working methods.

4.3 Designers

a. Ensure staff, are competent and adequately resourced to address the quality issues likely to be involved in the design.
b. Consider quality when designing structures, equipment systems, temporary works.
c. When carrying out the design, provide adequate information about any quality risks associated with the design.
d. Coordinate activities with that of others to improve the way in which quality is managed and controlled.

4.4 Quality Managers and Officers

a. Provide positive leadership within their area of operation and promote the adoption of best practice.
b. Promote an enthusiastic quality culture that delivers positive commitment to and engages all employees in continuous improvement quality performance.
c. Keep abreast of developments in quality legislation and industry standards.
d. Monitor and report on the effectiveness of the quality management system and progress against the quality performance standards and make recommendations for improvement as appropriate.
e. Monitor and report on operational quality performance and make recommendations for improvement

and monitor to ensure that effective action is taken.

f. Lead and provide functional management for any quality personnel under their control.
g. Assist with the identification of quality training needs, and monitor delivery and recording.
h. Monitor and report on the implementation of the approved quality objectives.
i. Produce quality performance reports as required.
j. Promptly alert line and functional management to significant quality issues and where appropriate be involved in the investigation and ensure that the findings are reported.
k. Review quality reports, identify any trends and ensure that there is an appropriate response to prevent future recurrence.

4.5 Section, Site, Discipline Engineers and Foremen

a. Appreciate the responsibility allocated to individuals within the operative and management structure.
b. Set a good example and leadership on the site.
c. Ensure that only trained and authorised workers use plant and equipment and that persons undergoing training do not operate plant and equipment unless closely supervised by a competent person.
d. Ensure that employees under their control attend quality induction training before working on the site and that they are correctly supervised at all times
e. Ensure that materials, plant and equipment under their control or brought to site by the subcontractor has any necessary certificates of test, inspection and examination and is safe to use
f. Ensure that clear instruction and information is given to persons under their control.
g. Carry out recorded quality inspections of site conditions.
h. Attend any meeting on quality issues as required and as applicable, co-operate with all personnel on matters of quality.

4.6 Supervisors

a. Supervisors are people at the first level in the organisation that have responsibilities over the work of others.
b. Provide positive leadership on quality issues for the members of the work team for which they are responsible.
c. Promote a positive attitude in the workforce and encourage behaviours that protect both people and the environment.
d. Monitor that personnel under their control comply with their individual responsibilities in quality matters.
e. Give personnel under their control, including contractors, clear instructions about the required methods of work.
f. Identify any quality training requirements of personnel under their control and advise appropriate management accordingly.
g. See that all quality issues are reported immediately to the relevant manager.

4.7 All Employees

Set a good personal example on quality issues within your area of operation.

5. Legal and Other Requirements

a. All work is to be undertaken in compliance with the requirements of Indian Law. If no local standard exists or the applicable standard is not specified, the appropriate and compatible internationally

recognised standard or code of practice shall be adopted.

b. The hierarchy of standards is as follows:
   i. Indian Standards (IN),
   ii. Euro Norm (EN),
   iii. British Standards (BS),
   iv. International Standards and Codes of Practice
   v. Alternative standards may be proposed if they can satisfactorily be demonstrated that they are equivalent, in all respects, to the defined standards. Where there is a discrepancy or a conflict, the higher or stricter standards shall take precedence. Project Partners are to ensure that all prescribed registers, certificates and records are maintained and available for inspection at the relevant work locations by any authorised person.

6. Quality Objectives

a. Quality objectives must be defined and made available for all internal and external stakeholders. The completion of the quality objectives must be checked on a regular basis and the measures must be adopted accordingly in line with the KRIDE's Quality Strategy and to achieve Right the First Time.
b. These quality relevant objectives (KPI) will be defined by the KRIDE's Executive Management and Program Team as appropriate.
c. Quality goals which are applicable to each program and/or project contract and particular type of work will be defined by the Project Partner with agreement of the Engineer.

7. Quality Standards, Codes and Specifications

a. Quality standards, codes and specifications must be defined during design and engineering by the engineering disciplines (infrastructure and civil works, system/MEP, rolling stock, operation and maintenance) for the different packages.
b. The program will comply with all pre-defined international codes and standards which satisfies the requirements of ISO 9001:2015 and deliver a state-of-the-art BSRP.

8. Tender and Procurement

a. Quality during tendering and procurement will be ensured by the following measures:
   i. All tendering documents must fulfil the requirements of ISO 9001:2015.
   ii. All program partners must be certified according to ISO 9001:2015. The certification must include the scope of services being provided to KRIDE and include the specific project location.
   iii. Basic quality requirements for all tendered parts must be defined (during design and engineering) with documentation by engineering discipline (e.g. infrastructure and civil works, system/MEP, rolling stock, operation and maintenance).
   iv. Define selection criteria based on selected capabilities and experiences.
   v. Define pre-qualification in line with KRIDE processes and procedures.
   vi. Detailed quality requirements must be defined by program partners according to the complexity of their scope of supply (to be defined during procurement Process).
   vii. Potential program partners must provide a provisional quality plan according to the complexity of their scope of supply (to be defined during procurement). This provisional quality plan must be submitted together with the bidding documents.
   viii. Ongoing improvements of quality requirements (e.g. change of standards) by the KRIDE program and potential program partners must be incorporated throughout the project lifecycle.
   ix. Tendering documents must be approved by engineering discipline, where applicable (e.g.

infrastructure and civil works, system/MEP, rolling stock, operation and maintenance).

9. Design and Engineering

a. The contractor must define:
   i. Design and engineering stages.
   ii. Review, verification and validation appropriate to each design and engineering stage.
   iii. Responsibilities and authorities for design and engineering.
   iv. Inputs, related to the contract requirements, must be defined as there are:
   v. Functional and performance requirements:
      - Applicable statutory and regulatory requirements.
      - When applicable, information derived from previous similar designs.
      - Other requirements essential for design and engineering.

b. Design and engineering outputs must:
   i. Define relevant standards, codes and specifications.
   ii. Meet the project requirements.
   iii. Define testing/inspection procedures as appropriate.
   iv. Provide appropriate information and documentation (e.g. for purchasing,
   v. Construction/production, testing, training, operation, maintenance etc.).
   vi. Be reviewed at suitable stages by an independent Design Verification Engineer (DVE) in order to:
      - Evaluate the ability of the results or design and engineering to meet requirements.
      - Identify any problems and propose necessary actions.

c. Design and engineering changes must be identified and records maintained

d. Design and engineering changes must be reviewed, verified and validated as appropriate, and approved by DVE before implementation.

e. Changes must be explicitly mentioned in order to highlight that the initial requirements have been altered.

f. During testing phase special attention should be paid to changes (of scope or quality requirements) to the project.

g. All defined quality relevant measures must be integrated in the contractor's Quality Management Plan (QMP).

h. Design and engineering results must be checked, evaluated and validated by DVE before construction/production begins. These checks, evaluations and approvals must be documented and reported (communicated). The quality of the design work must be validated by the DVE at the end of the contract.

10. Construction

a. To ensure adequate quality planning during the construction phase the following measures are foreseen:
   i. Program Partners must have a validated QMP
   ii. Copy of the contractor's current QMP
   iii. Schedule showing all foreseen tests/inspections
   iv. Schedule to perform audits in the contracted work
   v. Procedure describing the handling of corrective action
   vi. Procedure describing non-conforming items
   vii. Process for continuous improvement.

b. Program Partners must accomplish their work according to their validated QMP and have to:
   i. Fulfil quality requirements.
   ii. Accomplish the work according to the relevant standards, codes and specifications.
   iii. Document and report the accomplished work.
   iv. Train their personnel and assess their competencies.
   v. Fulfil the requirements related to the contracted work.
   vi. Perform and document planned tests/inspections.
   vii. Deliver as-built-drawings to KRIDE.
   viii. Demonstrate the traceability of all quality relevant issues.
   ix. Preserve products.
   x. Control the monitoring and measuring equipment, including documentation.
   xi. Perform and document internal audits.
   xii. Handle non-conformities according to the related procedure. Nonconformities must be demonstrated to KRIDE propositions/solutions resulting from nonconformities
   xiii. Carry out a continuous improvement (corrective and preventive action) with documentation. Solutions resulting from the continuous improvement process must be analysed
c. The Engineer will, as regularly as deemed appropriate, monitor work samples with a frequency to ensure quality:
   i. By inspecting the contractor's work on site.
   ii. Verify the contractor's work according to the QMP.
   iii. Perform and document planned tests/inspections.
   iv. Verify the as-built-drawings of the contractor.
   v. Analyse and approve changes within the contract.
   vi. Pay special attention to project changes (scope or requirements) during test phase.
   vii. Perform internal audits for each applicable contract.
   viii. Analyse non-conformities with the contractor and approve solutions.
   ix. Analyse solutions resulting from the continuous improvement process of the contractor within the contract and approve them.
   x. Testing
d. To ensure adequate quality planning during the test phase the following measures are foreseen:
   i. Involving of end-user
   ii. Organisation of test performance
   iii. Definition of test results
   iv. Test scheduling
   v. Definition of any quality procedures during test performance
   vi. Training of personnel, as required
   vii. Test documentation.
e. Performing quality assurance during the testing phase will be guaranteed by the following measures:
   i. Definition of functions
   ii. Observance and fitting of new designed functions with documentation
   iii. Observance and fitting of functions which caused problems during design and
   iv. Engineering or construction phase with documentation
   v. Observance and fitting of functions which have been changed or optimised during design and engineering or construction phase with documentation
   vi. Testing documentation in general.
f. KRIDE contracts complete packages. These packages consist in detail engineering, construction /

production, quality planning, assurance and control and at last quality verification.

g. KRIDE requires the fulfilment of the KRIDE Quality Policy, the quality objectives and the project quality plan(s) throughout the lifecycle of the contracted work.

11. Commissioning and Handover

a. To ensure adequate quality planning during the commissioning and handover phase the following measures are foreseen:
   i. Involving of end-user
   ii. Organisation of commissioning procedures
   iii. Definition of commissioning results
   iv. Commissioning scheduling
   v. Definition of specific quality procedures for commissioning process
   vi. Training of personnel
   vii. Commissioning documentation
   viii. As-built-drawings must be prepared and supplied upon completion.

b. To ensure adequate quality assurance during the commissioning and handover process a number of measures have to be foreseen. These measures include, but are not limited to a general check of project, project packages and interfaces, including check of:
   i. Documentation
   ii. Materials
   iii. Buildings and installations
   iv. Electrical equipment
   v. HVAC equipment (all building services)
   vi. Earthworks
   vii. Concrete works
   viii. Structural works
   ix. Waterproofing
   x. Painting and coating
   xi. Operation processes and procedures
   xii. Training processes
   xiii. Regular testing and inspection processes and equipment
   xiv. Emergency and escape procedures and equipment.

12. Operations and Maintenance

a. Quality planning during operation and maintenance will be guaranteed by adopting the following measures:
   i. Operation ability must be demonstrated and documented.
   ii. Operating rules must be defined.
   iii. Roles and responsibilities must be defined.
   iv. Operation personnel must be trained, including the certification of the trainees.
   v. New personnel must be trained according to the job-requirements before starting. Fulfilling of the job-requirements must be demonstrated and documented.
   vi. All training measures must be planned.
   vii. Required, adequate documentation (operation and maintenance manual) must be available.
   viii. Inspections must be planned.
   ix. Precautionary maintenance must be planned.

x. Inspection and maintenance personnel must be trained.
xi. Inspection and maintenance tools must be available.
xii. Spare parts must be available.
xiii. Inspection and maintenance documentation must be available.
xiv. Operation and maintenance procedures must be defined.

b. To ensure adequate quality assurance during operation and maintenance the following measures are foreseen:
   i. Operational ability procedure
   ii. Personnel training documentation and planning procedure
   iii. Inspection planning and documentation procedure
   iv. Maintenance planning and documentation procedure.

13. Training

a. To ensure adequate quality planning for the training the following measures are foreseen:
   i. Operation personnel must be trained according to a pre-defined training schedule with demonstration of the fulfilling (e.g. examination, depending on the job description) of the requirements.
   ii. Inspection and maintenance personnel must be trained according to a pre-defined training schedule with demonstration of the fulfilling (e.g. examination, depending on the job description) of the requirements.
   iii. New personnel must be trained according to the job requirements before starting. Fulfilling of the job requirements (e.g. examination, depending on the job description) must be demonstrated and documented.

b. To ensure adequate quality assurance for the training the following measures are foreseen:
   i. Personnel ability procedure
   ii. Personnel training documentation and planning procedure.

14. Closing

a. To ensure adequate quality planning for the closing process of the contract the following measures are foreseen:
   i. Operation ability must be demonstrated over a pre-defined period
   ii. Tests and inspections must be finished and documented
   iii. Personnel must be trained.

b. To ensure adequate quality assurance for the closing of the project all previous quality planning, assurance and control measures must be closed. Therefore, all project elements must be checked to ensure the required documentation is available and handed over to KRIDE. For example:
   i. Tendering and Procurement
   ii. Contracting
   iii. Design and Engineering
   iv. Construction
   v. Testing
   vi. Commissioning and Handover
   vii. Operation and Maintenance
   viii. Training.

c. A completion list will be implemented and all missing documentation must be compiled within an adequate timeframe. The contract will be closed when KRIDE gives a written confirmation of the final

acceptance of all deliverables before handover to the operator.

15. Quality Surveillance, Non-Conformities and Improvement

a. The Quality Manager (QM) must conduct internal audits at planned intervals to determine whether the QMP:
   i. Conforms to the planned arrangements and to the requirements of KRIDE
   ii. Is effectively implemented and maintained.
   b. An audit program must be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency and methods must be defined. An audit schedule must be prepared.

c. If non-conforming project execution is detected the following measures are required:
   i. Take action to eliminate the detected non-conformity
   ii. Authorise its use, release or acceptance under concession by a relevant authority
   iii. and, where applicable, by KRIDE
   iv. Take action to preclude its original use or application
   v. Take action appropriate to the effects or potential effects of the non-conformity, if the non-conforming project execution is detected after beginning of operation.

d. When non-conforming project execution is corrected it must be subject to re-verification to demonstrate conformity to the requirements.

e. Records on the nature of non-conformities and any subsequent actions taken, including concessions obtained must be maintained.

f. The QM must continually improve the effectiveness of the QMS through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and project quality reviews.

g. The QM must take action to eliminate the causes of non-conformities in order to prevent recurrence. Corrective actions must be appropriate to the effects of the nonconformities encountered and include, but are not limited to:
   i. Reviewing non-conformities
   ii. Establish the causes of non-conformities
   iii. Evaluating the need for action to ensure that non-conformities do not recur
   iv. Assessing and implementing corrective action
   v. Recording the results of action taken
   vi. Reviewing the effectiveness of the corrective action taken.

h. The QM must determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions must be appropriate to the effects of the potential problems, at least:
   i. State potential non-conformities and their causes
   ii. Evaluating the need for action to prevent occurrence of non-conformities
   iii. Set and implement the needed action
   iv. Records of results of action taken
   v. Reviewing the effectiveness of preventive action taken.

16. Quality Monitoring and Reporting

a. To ensure the effectiveness of the quality monitoring and reporting KRIDE will implement a quality committee who will meet regularly. This quality committee will analyse and report to the management team of the KRIDE program the following matters at least (not limited to the list below):

i. Minutes of the previous meeting/review of pending actions and decisions
ii. Quality key issues
iii. Project status
iv. Project documentation and reporting
v. Inspection and testing
vi. Surveillance
vii. Non-conformities and improvement
viii. Audits
ix. Next meeting

Appendix-IV - Organisation Chart and Key Positions

The Contractor shall provide the following organization chart for the Works as follows:

1) Head office Organization Chart

One organization chart shall be provided for the Contractor head office indicating the management and staff structure, with responsible personnel/departments described for all aspects of the work.

2) Site organization Chart

The Contractor shall provide the proposed site organization indicating the proposed structure, staff partners and positions necessary to adequately manage and control the Works.

The Contractor shall have a competent team of Managers, Engineers, Technical staff etc. so as to complete the work satisfactorily as per various requirements of the contract.

**** The Key Positions not limited to, and corresponding qualification and experience shall be as per *Clause 1.3 & 1.4 of this Section.***

Appendix-V - Plant and Equipment

The Tenderer or JV/ Consortium as a whole must deploy the minimum required Contractor's Equipment for the Works as given below.

S. No.	Type of equipment required for the work.	Minimum No. of Units of equipment required for the work	Maximum permissible age (In years)
a)	Piling Equipment Rotary Rig	4	5
b)	Excavators / Backhoe	4	5
c)	Fully Automatic and Computerized Batching Plant one with a minimum capacity of 60m³/h and a second of 30m³/h.	3	5
d)	Concrete Boom Placer Pumps	3	5
e)	Stationary Concrete Pumps	4	5
f)	Mobile cranes of adequate Jib length and capacity to reach platform level.	4	5
g)	Concrete Transit Mixers	10	5
h)	DG sets 500 KVA/250KVA	5 Nos	5
i)	Pile Cap/Raft shutters	12 sets for stations	5
j)	Pier/column shutters including starters for stations (GL to Track level)	24sets	5
k)	Cross beam shutters and staging materials for concourse level and track level for stations	20 sets	5
l)	Survey Instruments (Total station)	3 Nos	5

Notes:

i. The Tenderer shall undertake to deploy sufficient resources to carry out the Works. These resources are for peak period of each activity and shall be mobilised by the Contractor to suit his works programme.

ii. If the Contractor opts for short line method for casting, the number of pre-cast bed shall be increased accordingly.

iii. The Contractor's Equipment shall not be more than five years old reckoned from the date of original manufacture.

iv. Hiring of Cranes shall be as per approved vendors for supply of cranes. The contractors are free to propose and utilize plant and machinery after getting approval from the Engineer. Third party certification of cranes, competency certification of the operators etc. would be required before grant of approval.

v. Deleted

vi. The proposed Contractor's Equipment shall not in any event be construed as a submission of final requirement for the Works.

vii. Plant and equipment indicated above is minimum to be deployed at appropriate stage of the work. However, depending on the requirement to complete the work within the stipulated completion period the Tenderer shall deploy additional machinery as circumstances warrant at no extra cost. Plant and machinery above shall not be older than 5years. In case of failure of any plant and machinery deployed at site the same shall be repaired/replaced within 7days from the time of failure.

viii. Tenderer shall submit the copies of ownership of the equipment, In case of hire / purchase, Copies of MOU with the supplier/ owner of the equipment.

ix. *Contractor shall be penalized as deemed fit.

x. The above type of plant and equipment (but not limited to) may be required for execution of the work. The contractor shall submit the details of plant & equipment to be deployed in the above table within 28 days of issue of LOA to the Engineer for approval.

xi. Deleted.

xii. Deleted.

Appendix – VI – Office Accommodation, Equipment and Personnel

2 Accommodations for the Employer & Engineer (earmarked separately) with sufficient natural light & ventilation with the layouts, designs, materials, appliances, personnel etc. approved by GM / Corridor 2 / K-RIDE.

1.1 The contractor shall provide the following offices within the time limits specified (Refer Key Dates / Contract Data for details of Liquidated Damages, in case of delay beyond the limits):

1.1.1 Project office accommodation of at least 900 Sqm (with at least 30% of specific area decided by the Employer, air-conditioned) spread across 3 Project Offices (the minimum number mentioned in the scope) for the Employer & Engineer with air-conditioned cabins for senior officials of Employer and Engineer (as decided by the Employer) and conference halls, as per the approved drawings. Each Project Office shall have separate areas/buildings ear marked for Employer & Engineer, as approved by the Employer. Distribution and periodical redistribution of the above area in different offices will be done by the Employer as per the need.

1.1.2 Satellite Site office accommodation of at least 60 Sqm (with at least 30% of specific area decided by the Employer, air-conditioned) in each station and at casting yards for the Employer & Engineer with cabins, as per the approved drawings. Each Site Office shall have separate areas ear marked for Employer & Engineer, as approved by the Employer. Distribution of the above area in different offices will be done by the Employer as per the need.

1.2 In addition to the above area, covered parking facility shall be provided exclusively for the cars of Employer & Engineer for at least 2 Cars at each Project Office and for at least 1 Cars at each satellite Site Office. There shall be a portico or a basement (basically, a covered area from the location of getting off the car to the entrance of the office), so that officials do not get drenched during heavy rain, while entering the offices.

1.3 The above total area of 900 Sqm for project offices and 720 Sqm for Site offices, mentioned above, is considering 3 Project offices and 12 satellite Site offices. If there is an increase in this number as per the need, additional area @ at least 300 Sqm for each additional Project office and @ at least 240 Sqm for each additional satellite Site office shall be provided.

1.4 Small or teensy-weensy, cramped, grungy, shabby, dribbling, shoddy sheds / cabins with temporary / inferior materials / furnishings will not be allowed as project/site offices, even temporarily.

1.5 The following specifications shall be followed for various items of the Project / Site office earmarked for Employer/Engineer. All the requirements mentioned above and below are minimum requirements and shall be complied with. These are not exhaustive and any associated specification for any other relevant item can be specified by the Employer later by GM / K-RIDE. Superior specifications / materials than those specified can be used with the approval of GM / K-RIDE.

i. <u>False Ceiling</u>:

a. GI-powder coated (T & L) grid system and high-density fiber reinforced Cement board of approved brand, texture, colour & quality of size (1200 x 1200) mm, 6mm thick are having density of 1250 Kg / m3 conforming to ASTM-E84, ISI 14862-2004, respectively

ii. <u>Doors</u>:

a. 2.1 m X 1.2 m Teak wood door – (Main Door); Brass Fittings; PVC Doors or any other approved doors for toilets

b. Doors of approved material shall be provided for the cabins of various senior officials of Employer & Engineer and for the conference hall.

iii. <u>Windows:</u>

a. UPVC / Aluminium windows 3 track Sliding windows with M.S grill; frames with metal mosquito nets (gap-less) in one track

iv. Tiles:

a. Vitrified tiles (Scratch Proof) I Wooden flooring of approved brand & quality for office cabins & common rooms; Antiskid tiles of approved brand & quality for the floors of bathrooms

v. Toilets, Plumbing & Sanitary ware:

CPVC pipes for internal work and PVC pipes for outer walls (2.5" PVC pipes)

All Fittings shall be of ISI standard. Ceramic Fittings of approved brand & quality shall be provided for all sanitary ware of washrooms & washbasins. All plumbing fittings, doors, handles etc., shall be of approved brand & quality.

Attached washrooms with one wash basin with pedestal (or wall mounted) and a platform and one wall mounted EWC shall be provided for at least four cabins and for conference hall in each Project Office and for at least two cabins in each Site Office. The Employer may redistribute the above as per the requirement. In addition, at least one common toilet each with at least four urinals for men and at least two EWCs shall be provided near the common area in each Project Office. In addition, one exclusive toilet with one washbasin and one EWC shall be provided for Female staff in each Project Office I Site office. At least one attached washroom with one wash basin and one EWC shall be provided in one cabin in each Site office. At least one common toilet with at least two urinals and at least two EWCs shall be provided in each Site Office. In addition, one separate toilet (outside the building) with one washbasin and at least one IWC shall be provided in each Project Office and each Site Office for assistants, office boys site attendants, drivers, mechanics, cleaning staff etc. By all means, uninterrupted clean water supply shall be ensured in all these toilets for all the 24 hours till the end of DLP. Hand wash of approved quality shall be available on all wash basins and it shall be recouped as and when required. Hand towels of approved quality and colour shall be available on a towel rod I hanger near all wash basins and the same shall be got washed once in every 2-3 days, depending on the need. They shall be replaced as and when necessary.

All project offices I site offices and their premises and all the toilets (attached, common and outside) shall be maintained in a clean and hygienic condition by deploying dedicated staff for this purpose. The cleaning of all the toilets shall be done frequently (common toilets - once in about 2-3 hours). The exact frequency of cleaning of each toilet will be specified by the Employer based on the need in each Project office I Site office and the same shall be meticulously followed.

All the toilets shall be provided with mosquito nets and efficient & noise-less exhaust fans. The nets shall be periodically checked for any gaps, holes etc., through which mosquitoes can enter and the nets shall be always maintained hole-free and gap-free. The exhaust fans shall be always maintained in proper working condition.

The dimensions of toilets and disposition of openings and fittings shall be at least in accordance with the anthropometric data as per the relevant IS code(s).

vi. Electrical Wiring:

a. Concealed wiring with fire proof cables of IS standard, as directed, with approved materials

vii. Electrical Fittings & Appliances:

a. Switches, fans, split type air conditioners of required tonnage (to suit the cabin concerned or the conference hall) and fluorescent ceiling lamps (LED I CFL) of sufficient lumen of approved brand, lumen & quality.

b. The outer units of split type air conditioners shall be sufficiently away from the cabins or conference halls, as approved by the Employer, so that the noise is not audible to the officials

viii. Painting:

Inside: primer one coat +2 coats of emulsion paint of approved brand and colour. Oustside:1coat primer+2 coats of weather proof paint of approved brand and colour.

ix. Others:

a. Overhead water tanks with sufficient Head of water to ensure the required velocity for water supply; Septic tanks authorised connection to public sewerage system

x. Networking:

a. Wiring with CAT6E cable or superior, with switches and router connector point as per the approved Plan.

xi. Intercom: A system of intercom telephones, as specified and approved

1.6 The contractor shall provide at least the following furniture I facilities in each project office and site office for the use of Employer and Engineer:

a. Manager's Premium tables of approved brand, colour, texture, height & quality: size at least 5'x3' L-table with side cadenza complete with laminate finish - at least 4 nos. in each project office and at least 01 no. in each site office

b. Executive Tables of approved brand, colour, texture, height & quality: size at least 4'x3' table with side cadenza complete with laminate finish - in least 6 nos. at each project office and 02 nos. in each Site office

c. Conference Tables (20' x 6' approx.) of approved brand, colour, texture, height & quality with conference chairs: for 20 - person seating - 01 no. (in each project office)

d. Workstations of approved brand, colour, texture & quality with partitions up to the approved height: size 4'x 5'. Modular workstations green ply makes with merino Laminate and storage cabinets - in least B nos. in each project office and at least 3 nos. in each site office.

e. Workstations of approved brand, colour, texture & quality with partitions up to the approved height: Modular size 4'x3' straight workstation with partition and storage. Cabinets under the working counter as per the approved plan-10 nos. (10 nos. in each project office)

f. High back High quality revolving Executive chairs of approved brand, colour, texture & quality with tilt able neck rest and adjustable hand rests (adjustable in 3 dimensions) and with fabric finish - at least 5 nos. in each project office (one for each cabin and one for each conference hall) and at least 01 no. in each site office

g. Medium back revolving chairs with hand rests of approved brand, colour & texture and quality with FRP finish- at least 30 nos. in each project office and at least 10 nos. in each site office (these include visitor's chairs)

h. Low back revolving chairs of approved brand and quality with FRP finish - 24 nos. (for each Project office)

i. White magnetic boards and pin boards in each room /work stations, white board with stand & 4 white board markers of approved colours (to be recouped as and when needed) and one LED TV of 55 inch (LG, Samsung, Sony make)of approved size, brand and quality for projecting the presentations for conference room (for each Project Office).

j. Racks & shelves as per the requirement in all chambers and common area, as approved.

k. Supplying, erection, testing and commissioning of Off-Line UPS system suitable for operation with all accessories on sufficient power back up (with minimum backup time of

2 hours) including 12V DC, AH Batteries in polypropylene container for UPS low maintenance tubular batteries, to meet the power load in case of power disruption (for project office). The system should be able to feed the power to all the desktop computers, printers etc. for at least 4 hours continuously.

l. Split type air-conditioners of approved make and quality - 1.0 Tonne capacity – at least 03 nos. (at least 02 nos. in each project office and at least 01 no. in each Site Office); 1.5 Tonne capacity - at least 04 nos. in each project office for cabins; 2 air conditioners of 1.5 Tonne or required capacity for each Conference hall in each project office.

In addition, the contractor shall provide the following for each Project/Site Office:

a. Telephones, intercom & High-speed Broad Band Connection - 2 Land line connections + 10- line intercom with instruments & Broad Band Connection.
b. Digital colors Photocopy Machine (Up to A3 size)- 01 no. of approved brand & quality
c. Refrigerator (290 Litre capacity) - 01 no. of approved brand & quality
d. Microwave oven – 02 nos. of approved brand & quality
e. Drinking Water Dispenser (Hot, Cold & Normal) - 01 no. of approved brand & quality
f. Tea / Coffee Dispenser - 01 no. of approved brand & quality
g. Standby DG Power - As required, to run and maintain the office for at least 6 hours.
h. Safety Helmets, Boots, and any other safety device - as per Requirement to be specified by the Employer / Engineer.

NOTES:

Though the above requirement of furniture and others is mentioned for each office, GM / K-RIDE may redistribute the total requirement as per the need of each quarter or earlier. Transporting the same from / to each project / site office each quarter or earlier, based on need, forms a part of the scope of the work. The sizes of a few tables, side racks etc. may be more or a little different from the sizes mentioned above, to suit the layout. The decision of the Employer is final in this regard.

In addition to the above, the following furniture, appliances, equipment, and tools are required combined for all the project/site offices (This is additional requirement for all the offices. Distribution and periodical redistribution of these to various Project & Site offices will be done by the Employer, as per the need). GM may alter the specifications depending on market availability, requirement and other site considerations etc.

i. Side units with table - 30 sets
ii. Filing cabinet (36 lockers unit) – 15 nos.
iii. Lockers cabinet (36 lockers unit) – 12 nos. iv. Steel Cupboard - 12 nos.
iv. Digital Camera – 01 No.
v. Crockery including cups and saucers – 50 sets.

1.7 The contractor is required to maintain the offices till the end of DLP and to provide the following (but not limited to):

i. Timely pay all electricity/phone/water/high-speed Broad band charges (A nominated staff member of the contractor shall take care of timely payment without being reminded.)
ii. Timely provide all stationery items and consumables for office use and keep a reserve, as approved (A nominated staff member of the contractor shall take care of them and ensure reserve supplies.)
iii. Carry out all necessary repairs to office, equipment, appliances, toilet fittings immediately, as and when required, without any delay (A nominated staff member of the contractor shall daily inspect all of them and identify any problem and undertake repairs, even without being told.)

iv. Provide mineral water bottles as per the daily consumption of the staff (A nominated staff member of the contractor shall take care of them and ensure reserve supplies.)

v. Provide tea, coffee,\ snacks, sanitizers, tissue papers etc., as per the requirement and advice, during meetings/discussions and during late evening/early morning/night working etc. (A nominated staff member of the contractor shall take care of them, without any delay.)

vi. Arrange proper and safe conveyance (through four wheelers engaged for this purpose) to female staff working for Employer/Engineer, whenever the work gets delayed and whenever the situation warrants (as decided by the Employer) - (A nominated staff member of the contractor shall take care of them.)

1.8 Fire extinguishers shall be provided as per the recommendations of the Bengaluru City Fire Brigade.

1.9 To facilitate coordination for site activities, testing, inspections, liaison with other concerned agencies etc., the contractor shall provide two vehicles of approved make, model and quality along with drivers till the end of the contract period for each project office and one till the end of DLP for each project office, to the Employer.

1.10 The contractor shall provide, erect, and maintain appropriate name boards, as specified, with approved materials, for each of the offices and cabins. The material of each name board, font size, font type, spellings etc. on each name board and their locations shall be as approved by the Employer before they are erected.

1.11 The contractor shall supply the following personnel within 30 days from the date of issue of LOA for the use of the Employer, till the end of DLP.

a) Watchmen: Round the clock at each Project / Site office
b) Office Assistant / Secretary: 08 nos.
c) CAD Operator / Technical Assistant: 03 nos.
d) Computer Programming Assistant: 04 nos.
e) Office boy cum Site attendant: 12 nos.

The candidature of all the above personnel shall be as personally approved by the GM/C2/K-RIDE. Any inefficient / problematic personnel shall be replaced forthwith. The qualifications, expertise,
allotment of work, working time, shifts, overlap time, grouping, seating arrangement and any other related matter will be as decided by the Employer. The decision of the GM/C2/K-RIDE is final in all these regards. Proper approved safety equipment shall be provided for the site attendants.

2 Equipment for the use of Engineer and Employer:

The contractor shall provide the following new equipment and software at each Project/ Site office as listed and maintain them for the exclusive use of the Employer and the Engineer till the end of DLP (**The distribution will be done by the Employer**):

(a) Desktop Computers (with computer tables) – 06 nos. of approved brand & quality with cordless keyboards and cordless mice, as approved by the Employer. The computers shall be Intel core i7 or its latest generic descendent or higher, running at the specified and approved clock rate (Hyper technology) with no wait state, If the Central Processing Unit has no floating-point arithmetic capabilities, a math-coprocessor shall be installed.

A minimum of 1TB (SSD) 5400RPM 16GB RAM with software configurable into extended memory and expanded memory. The expanded memory shall be one combo drive (DVD, R / CD RW), (7200 RPM); 27" colors monitor - 04 nos. and 22" colors monitor - 02 nos.

(b) Lap Top Computers with carry cases – 5 nos. of approved brand & quality – with at least 15.6" display, as approved by the Employer.

Both the desktop & laptop computers shall at least have the following specifications:

1. Processor: Intel core i7 or higher, 5.0 GHz (hyper technology) with in-built LAN, Modem, AGP card, Audio Card, and Wi-Fi Internet Card.

   i. Cache Memory: 512 KB L2 cache
   ii. Memory: 16GB DDR RAM Expandable up to 32GB
   iii. Hard Disk: 1 TB or at least 500 GB - preferably SSD

2. At least 1920 X 1080 resolution, S3 VIRGE MX 3D Graphics Controller Chip, 64 Bit Graphics Accelerator, Bit BLT hardware

3. Pointing Device: 102 multimedia Keyboard Acupoint Point Device

4. Ports: 1 Parallel, 1 Serial, at least 2 USB Ports, PS I 2 Mouse I Keyboard, SVGA Video Port, Line in Jack, Headphone & External Microphone Jack, 1 Serial Infrared Port, USB port with Wi-Fi LAN.

5. Card Bus: 2 x PCMC1A Slots (Type II) or 1 x PCMC1A Slot (Type III) Card Bus ready.

6. Battery I Power: AC Adaptor I Li-Lon rechargeable battery with built in battery charger & Software Power Management.

7. OS I Software: Pre-installed Windows 11 professional or Mac OS as approved, latest version of MS office, Windows Utilities, Mediamatics Arcade Pak, Diagnostic Utilities, Ring Central, MS Internet Explorer, Norton Anti-Virus, Speech activated typing software, latest version of MS Project I Primavera (as approved).

8. Communication: 56 Kbps Integrated Fix I data Modem with V.90 support; Speakers

9. Carrying Case: Laptop carrying cases (for all the Lap top computers) of approved brand and quality.

NOTE: Recoupment of batteries of cordless keyboards and mice, as per the requirement, are included in the scope.

(c) Printers – 08 nos. (A4 size – 04 nos. A3 size – 03 nos and Plotter of A0 size – 01 nos.)

At least one printer of A0, A3 & three printers of A4 size shall be Colour; Two printers of A4 size shall be Laser Colour; Timely replacement of Toners / Cartridges with original ones, as per the consumption pattern

(d) Languages:

Python (latest version), Java and any other language as directed by the Engineer. (e)

Application Software:

(i) Microsoft office, latest release
(ii) A database management package as approved by the Employer
(iii) Latest licensed version of AUTOCAD Civil 3-D, for 05 users.

(e) Project Management Package (Microsoft Project) I Primavera V. P6-2 licenses (1 Core Module and 1 Web based Module), as approved Multimedia, as approved

(f) UPS system with sufficient power backup (with minimum backup time of 2 hrs.) to meet the power load in case of power disruption.

(g) Surge Protection Devices (one for each computer and printer as given above) Power supply for the systems is to be AC 240 volts, 50 Hz from normal building wiring circuit mains, Power regulator, stabilizer or transformer should be supplied by the contractor for the computer systems such that the systems can function efficiently.

(i) Four mice with cord (not cordless) for standby purpose.

NOTE: Though the above requirement of computers and others is mentioned for each office, GM I K- RIDE may redistribute the total requirement as per the need in each quarter or earlier and transporting and reinstalling the equipment from I to each project I site office each quarter or earlier, based on need, forms a part of the scope of the work.

NOTES:

a. The items under Clause 2.0 above can be retained by contractor (except 2.0 (e)-Application Software) after the completion of the project / DLP, as specified.

b. The tenderer is supposed to take all the above requirements and the above retention clause into account while quoting the price. The above requirements are for effective execution and close monitoring of the progress and quality of work and the all the conditions and provisions will be enforced in letter and spirit.

3 **Documentation**

3.1 A complete set of documentation will be supplied with each System. The documentation should be self-tutorial in nature and be readily understood by non-computer personnel.

The following manuals shall be supplied with the system:

a. Manual on how to operate the equipment; and

b. Manual on how to use the facilities and software provided by the supplier. (Including languages and utilities)

4 **Auto CAD Operator:**

The contractor shall provide one sufficiently experienced Auto CAD operator with a separate desk top computer, 27" monitor, computer table, computer chair, keyboard, mouse and all other relevant items and software including licensed version of latest Auto CAD software exclusively for the Engineer till six months beyond the date of completion of contract. This is in addition to the requirement of CAD operators specified earlier. The candidature of the above personnel shall be as approved by the Employer.

Appendix VII - Document Submission and Response Procedure

1 Project Management Information System (PMIS)

The Contractor shall utilize a PMIS integrating with BIM software such that all documents generated by the Contractor can be transmitted to the Engineer by electron ic means (and vice versa) and that all documents generated by either party are electronically captured at the point of origin and can be reproduced later, electronically and in hard copy. A similar link shall also be provided between the Engineer office at site and the Employer's Office by the Contractor. Make or standard of PMIS shall be as directed by Employer.

IFC format (Industry foundation Classes)

IFC list format is a platform neutral format. Hence all / any BIM program used by tenderer should provide files in IFC format for interoperability between different BIM programs.

2 Submissions To The Engineer

The general requirements are as follows:

2.1 Project Management Information System (PMIS)

1) The Employer shall provide a web-based information management system of transmittal for formal project correspondence, documents and information to ensure efficient information management on the Project. Where it is necessary to transmit original signed documents, these shall be acceptable forms of correspondence only when they have been issued via the system first.
2) The Employer shall provide the Project-wide use of the system during the Design and Construction Phases and also the Defects NotificationPeriods.
3) The system shall be capable of issuing a list of outstanding responses from the Engineer 7 days before the due date of theresponse.

2.2 Drawing And Specification Register

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

2. Records And Reports

a) Format

Reports and records are to be submitted via the system to the Engineer and shall be in a format agreed by the Engineer. Reports and records shall be signed prior to submission by the Contractor's agent or by a representative authorized by the Contractor.

b) Project Document Control Procedure

Within twenty-eight (28) days after Commencement Date, the Contractor shall submit via the system a Project document control procedure to the Engineer for review, which shall include but not be limited to thefollowing:

1) a document approval system which shall specify the level of authority for approval of all documents and material before submission to theEngineer;
2) a system of issuing documents to ensure that pertinent documents are issued to all appropriate locations;
3) a document change or re-issue system to ensure that only the latest revision of a document can

be used; and

4) a submission identification system that identifies each submission uniquely by the following:
   a) contractnumber;
   b) discipline;
   c) submission number;and
   d) revisionindicator.

c) Project Record

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

d) Adequacy Of The Project Record

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

3. Submission And Response Procedure

4.1 General

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

4.2 Proposal

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

4.3 Submission Response Request

For each stage of submittal, the Contractor shall prepare a Submission Response Request (SRR) carrying the date of submission, the submission reference number as defined in Clause 2.2 (4) above, the submission title, the stage of submission (e.g., Technical Design, etc.), and the authorized signature of the Contractor's responsible engineer to confirm that, in the opinion of the Contractor, the submission:

1) Complies with all relevant requirements of the Employer's Requirements;
2) conforms to all interface requirements;
3) contains, or is based on auditable and proven or verified calculations or design criteria;
4) has been properly reviewed by the Contractor, according to the Contractor's Quality Assurance System, to confirm its completeness, accuracy, adequacy and validity;and
5) has taken account of all requirements for approval by statutory bodies or similar organizations, and that where required, such approvals have been granted.
6) contains 2 (two) properly signed copies of Independent Design Checker Certificate (Form IDCC) and 2 (two) properly signed copies of the Construction Design Pack Certificate (Form CDPC).

4.4 The Engineer's Response

The Engineer's response to all the submission from the Contractor will be made within 21 calendar days of receipt of the submission. If the submission is made later on the Design Submissions Programme, the Engineer may extend the review period depending on the amount of documentation accompanying the submission.

4.5 Monthly Design Review Meetings

Throughout each Design Stage, the Contractor shall attend monthly design review meetings with the Engineer. At these Engineer's review meetings, the Contractor shall present information, drawings and other documents to the Engineer in respect of all submissions programmed to occur during the following five-week period. The Contractor's presentations shall be in sufficient depth to enable the Engineer to obtain a clear understanding of the Contractor's proposals and to discuss the methodology and process used in reaching the proposed design solutions.

4.6 The Engineer's Observations

The Contractor shall record all of the Engineer's observations and any agreed actions resulting from the Engineer's review meeting and shall address each of these fully before submission of the respective documents for formal review.

4.7 Notification

If, in the Engineer's opinion, following receipt of a submission there is benefit to be gained from a meeting with the Contractor to clarify or discuss any of the contents of the submission, he will notify the Contractor accordingly with not less than 3 days' advance notice, and the Contractor shall attend at the time and place appointed by the Engineer.

4.8 Notice Of No Objection

The Contractor in respect of the Works or any sub-system, part or section may make no submission thereof unless a Notice of No Objection with Comments has been received for the previous stage of the same Works or any sub-system, part or section thereof.

5. Responsed Procedure

5.1 Responsed Procedures

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

1) "Notice of Rejection" (with "A" Comments)
2) "Notice of NoObjection"
3) "Notice of No Objection with Comments" (with "B" or/and "C" Comments)

5.2 Response Definition

Definition of the Engineer's response:

1) "Notice of Rejection" (with "A" Comments) if following his review of the submission, the Engineer discovers major non-compliance, discrepancies or omissions etc. that in his opinion are of a critical nature, the Engineer will issue a "Notice of Rejection" (NOR) with type "A" comments. The Contractor shall revise and Re-Submit within 15 calendar days of receipt of "Notice of Rejection" from the Engineer addressing the Engineer's comments. Subsequently the Engineer shall respond within 15 calendar days of receipt of the resubmission. Following the issue of a NOR by the Engineer the Contractor is not entitled to proceed to the next programmed stage for that section of the work until all of the Engineer's comments have been fully addressed and a NONO issued.
2) "Notice of No Objection" if following his review of the submission the Engineer has not discovered any non-compliance with the contract the Engineer will issue to the Contractor a formal "Notice of No Objection (NONO). A NONO from the Engineer irrespective of with or without comments does not in any way imply the Engineer's consent of the submission nor does it remove any responsibility from the Contractor for complying with the Contract. Issue of a NONO from the Engineer entitles the Contractor to proceed to the next stage of the programmed work.
3) "Notice of No Objection" (With Comments) if following his review of the submission the Engineer discovers discrepancies or omissions etc. that in his opinion are not of a critical nature the Engineer may issue a "Notice of Objection" with Comments, (NOWC) the comments will be of either type B or type C as defined below. The Contractor shall respond to the comments in accordance with the requirements of Clause 4.3.

Following the issue of a NOWC by the Engineer the Contractor is entitled to proceed to the next stage of the programmed work subject to the inclusion of amendments necessary to address the comments.

6.0 The Contractor shall respond to Type B and C comments and get the Engineer agreement and closure prior to full inclusion in the Final Design.

6.1 The Engineer's Comments

Definition of the Engineer's comments:

1) Type "A" Comments are of a critical nature that renders the submission non-compliant with the Contract, the submission shall be corrected and resubmitted.
2) Type "B" Comments are of an intermediate nature that shall be responded, agreed and incorporated.
3) Type "C" Comments are of a minor nature or may affect future submissions.

7 Records

The Contractor shall establish and maintain a place for the storage and archiving of all the documents relating to the Works and are not required to be submitted to the Engineer under Clause 2.

8 Implementation Of Bim System

(i) Civil Contractor shall implement BIM system for executing and delivering the services set out in this Agreement. Building Information Modelling (BIM) uses computing power and systems to create 3D models of all kind of buildings and infrastructure, with information about its design, operation and current condition. At the planning and design stage it enables designers, owners and users to work together to produce the best possible designs and to test them virtually before they are constructed. During construction, it enables Employer, contractors and suppliers to integrate all components cutting out waste and reducing the risk of errors. In operation it provides users with real-time information about available services and facility managers with accurate assessments of the condition of assets.

(ii) All station structure designs/proof checking shall be done using BIM modelling. Civil Contractor shall implement the necessary hardware, software and human resources towards this end. 3D Coordination between all disciplines shall be achieved by incorporating them in a single model.

(iii) Contractor shall be required to produce, update and present to Employer on a fortnightly basis an integrated 3D BIM model incorporating rail track (Viaduct), topography, architecture, structure, plumbing and all other building services and system wide requirements in design review meetings. These models shall be 3D rendered and shall help in design visualization and clash detection of elements as well as finalization of design.

In addition, Contractor shall also provide following individual models: -

1. Rail alignment Modelling
2. Structure design modelling
3. Terrainmodelling
4. Quantity take-off from BIM model wherever required
5. Visualization and Animated Walk through
6. Clash detection

(iv) Final coordinated GFC drawings of all disciplines shall only be generated from the BIM model.

(v) The contractor shall develop as built" BIM Model up to LOD 500 level and submit the same to Employer at the time of completion of the project. Schedule of BIM implementation Plan and standards to be adhered to, shall be provided after award of contract.

(vi) **IFC format (Industry foundation Classes)**

IFC list format is a platform neutral format. Hence all / any BIM program used by tenderer should provide files in IFC format for interoperability between different BIM programs.

Appendix VIII - Drawing List

Refer Section 11 of Tender Document

Appendix-IX - Work Areas

No land shall be made available by the Employer for casting yard, site offices, and site laboratories. Contractor shall make his own arrangements at his own cost. In case, the Railway land / Govt. land is available adjacent to railway track for contractor's temporary construction use / enabling works yard, the necessary land rent / lease charges shall be levied as advised by Railway concerned / Govt. authority norms / K-RIDE norms and the same will deducted from IPC 's of the Contractor.

Appendix-X - Works Areas & Temporary Power Supply

1. Introduction

(1) The Contractor shall provide within the designated principal Works Areas, at locations agreed with the Engineer, the compounds and facilities for the Engineer and other contractors of the Employer defined under Clause 2 of this Appendix.

(2) The standard conditions applying to the use of any Works Area by the Contractor for its site facilities are given under Clause 2 of this Appendix.

(3) The Conditions for supply of electricity by the Contractor to Designated Contractors are given under Clause 3 of this Appendix.

2. Standard Engineering Conditions

The following standard engineering conditions apply to all Works Areas:

(1) Formation

(a) The Works Areas shall be formed to the levels that the Engineer has given his consent. No such levels shall be amended without prior consent of the Engineer.

(b) The Works Are as shall be surfaced in a manner agreed with the Engineer, compatible with their intended use, and, inparticular, footpaths and roadways connecting facilities shall be clearly defined. Measures shall be taken to the satisfaction of the Engineer to ensure all areas are properly drained and kept free of static water.

(c) The removal, diversion or reinstatement else where as may be required of any existing works or installation whatsoever within the Works Areas shall be carried out to the satisfaction of the Engineer.

(2) Roads & Parking

(a) Space shall be provided within the Works Areas for parking, loading / unloading and maneuvering of motor vehicles.

(b) Any damage done to the adjoining public roads and fixtures and properties (public or private) shall be made good to the satisfaction of the Engineer.

(3) Drainage & Sewerage

(a) All storm or rainwater from the Work Areas including any access roads thereto shall be conveyed to the nearest stream course, catch-pit, channelor storm water drain as required by the Engineer. All temporary and permanent works shall be carried out insuch a manner that no damage or nuisance are caused by storm water or rain water to the adjacent property.

(b) No drain or water course shall be used without consent of the Engineer.

(c) Damages or obstructions caused to any water course, drain, water-main or other installation within or adjoining the Works areas shall be made good to the satisfaction of the engineer.

(d) Treatment and disposal of sewage and waste water from the works areas shall be provided to the satisfaction of the engineer.

(4) Buildings

(a) No permanent structures other than those required for the Permanent Works shall beTemporary permitted on the Works Areas.

(b) Electricity, water, telephone and sewerage shall be provided by the Contractor, as required, for all temporary buildings.

(c) No potable water obtained from the Govt. Sources shall be used for heating, cooling and humidification purposes,or vehicle washing without the written consent of the Engineer.

(5) Pedestrian Access

Every existing pedestrian access throughout the Works Areas shall be maintained in a usable condition at all times to the satisfaction of the Engineer including lighting, signing and guarding.

(6) Fencing

The Works Areas shall be secured against unauthorised access at all times. In particular fencing or the like shall be maintained, removed and re-erected in the new location wherever and whenever a Works Area is relinquished in stages.

3. **Applicability**

(1) Where theContractor is required to provide temporary electrical supplies, or to use, extendor expand on temporary supplies installed by others, all such activity shall be executed in accordance with Paragraphs of this Appendix.

(2) When the Contractor makes use of temporary electrical supplies provided by others he will observe and comply with the requirements of this Appendix.

4. **Work On Site**

(1) The contractor shall nominate are presentative whose name and qualifications shall be submitted in writing to the Engineer for review not later than 4 weeks before the appointment and who shall be solely responsible for ensuring all the necessary electrical equipment on site. The contractor shall not install or operate any temporary site electrical systems until his representative is appointed and has commenced duties.

(2) The name and contact telephone number of the epresentative having been reviewed without objection by the Engineer shall be displayed at the main distribution board for the temporary electrical supply so that he can be contacted in case of an emergency.

(3) Schematic diagrams and the details of the equipment for all temporary electrical installation s shall be submitted by the Contractor, and these diagrams together with the temporary electrical equipment shall be submitted to the Engineer for his consent.

(4) Alle lectrical installation work on Site shall be carried out in accordance with the requirements laid down in BS 7375 and the Specification. All work shall be supervised or executed by qualified and suitably categorized electricians, who are registered as such under the Electricity Ordinance 1990 / Electricity (Registration) Regulations 1990.

5. **Electrical General**

Temporary electrical Site installation sand distribution systems shall be in accordance with: -

(1) Indian Electricity Rules
(2) The Power Companies' Supply Rules;
(3) Electricity and its subsidiary Regulations;
(4) IEE Wiring Regulations (16th Edition);
(5) BS 7375 Distribution of Electricity on Construction and Building Sites;
(6) BS 4363 Distribution Assemblies for Electricity Supplies for Construction and BuildingSites; and
(7) BS 6164Safety in Tunneling in the Construction Industry.
(8) Any other applicable national standards

6. **Materials, Appliances And Components**

All materials, appliances and components used within the distribution system shall comply with BS 4363 and BS 7375 Appendix A.

7. **Design Considerations**

(1) Distribution equipment utilized within the temporary electrical distribution system shall incorporate the following features:-

a) Flexibility in application for repeated use;
b) Suitabilityfortransportand storage;
c) Robust construction to resist moisture and damage;and
d) Safety in use.

(2) All cabling shall be run at high level whenever possible and firmly secured to ensure they do not present a hazard or obstruction to people and equipment.

(3) The installation on Site shall allow convenient access to authorized and competent operators to work on the apparatus contained within.

8. **Mains Voltage**

(4) The site mains voltage shall be as per the electricity authority, 415V/3 phase 4 wiresystem.

ii. Single phase voltage shall be as per the electricity authority, 230V supply.
iii. Reduced voltages shall conform to BS7375.

10. Types of Distribution Supply

The following voltages shall be adhered to for typical applications throughout the distribution systems:

iv. fixed plant-415V/3phase;
v. movable plant fed by trailing cable-415V/3 phase;
vi. installations in Site buildings- 230V/1phase;
vii. Fixed flood lighting-230V/1phase;
viii. Portable and hand held tools-115V/1phase;
ix. Site lighting (other than flood lighting)-115V/1phase; and
x. Portable hand-lamps (general use)-115V/1phase.

11. When the low voltage supply is energized via the Employer's transformer, any power utilized from that source shall be- cither 415 V. 3 phase or 230 V. 1 phase as appropriate.The Contractor shall carry out any conversion that may be necessary to enable him to use power from that source.

12. Protection of Circuits

f) Protection shall be provided for all main and sub-circuits against excess current, under and over voltage, residual current and earth faults.The protective devices shall be capable of interrupting (without damage to any equipment or the mains or sub-circuits) any short circuit current that may occur.

g) Discrimination between circuit breakers, circuit breakers and fuses shall be in accordance with: -
(i) BS 88;
(ii) BSEN 60898; and
(iii) BS 7375;
(iv) Any other appropriate Indian Standards.

9. **Earthing**

(1) Earthing and bonding shall be provided for all electrical installation sand equipment to prevent the possibility of dangerous voltage rises and to ensure that faults are rapidly cleared by installed circuit protection.

(2) Earthing systems shall conform to the following standards: -
a) IEE Wiring Regulations (16th Edition);
b) BS 7430;
(c) BS 7375;and
(d) IEEE Standard 80 Guide for Safety in AC Substation Grounding.

10. **Plugs, Socket Outlet Sand Couplers**

Low voltage plugs, sockets and couplers shall be colors coded in accordance with BS 7375, and constructed to confirm BSEN 63809 high voltage coupler sand 'T' connections shall be in accordance with BS3905.

11. **Cables**

(1) Cables shall be selected after full consideration of the conditions to which they will be exposed and the duties for which they are required. Supply cables up to 3.3KV shall be in accordance with BS 6346.

(2) For supplies to mobile or transportable equipment where operation of the equipment subjects the cable to flexing, the cable shall conform to one of the following specifications appropriate to the duties imposed on it:

c) BS6708 flexible cables for use at mines and quarries;
d) BS6007 rubber insulated cables for electric power and lighting; and
e) BS6500 insulated flexible cords and cables.

(3) Where low voltage cables are to be used, reference shall be made to BS 7375. The following specifications shall also be referred to particularly for under ground cables:-

a) BS6346 for armored PVC insulated cables; and

b) BS6708 Flexible cables for use atmines and quarries.

(4) All cables which have a voltage to earth exceeding 65 V (except for supplies from welding transformers to welding electrodes shall be of a type having a metal sheath and/or armour which shall be continuous and effectively earthed. In the case of flexible or trailing cables, such earthed metal sheath and/or armour shall be in addition to the earth core in the cable and shall not be used as the sole earth conductor.

(5) Armoured cables having an over sheath of polyvinyl chloride (PVC) or an oil resisting and flame retardant compound shall be used whenever there is a risk of mechanical damage occurring.

(6) For resistance to the effects of sunlight, overall non-metallic covering of cables shall be black in colour.

(7) Cables which have applied to them a voltage to earth exceeding 12 V but not normally exceeding 65 V shall be of a type insulated and sheathed with a general purpose or heat resisting elastomer.

(8) All cables which are likely to be frequently moved in normal use shall be flexible cables. Flexible cables shall be in accordance with BS 6500 and BS 7375.

12. **Lighting Installation**

(1) Where Site inspection of the Works is required during the nights, the Lighting circuits shall be run separate from other sub-circuits and shall be accordance with BS 7375 and BS4363.

(2) Voltage shall not exceed 55V to earth except when the supply is to afixed point and where the lighting fixture is fixed in position.

(3) Luminaries shall have adegree of protection not less than IP54. In particularly bad environments where the luminaries are exposed to excesses of dust and water, a degree of protection to IP65 shall be employed.

(4) The Contractor shall upgrade the lighting level to aminimum of 200 lux by localized lighting in all areas where required by the Engineer.

(5) Mechanical protection of luminaries against damage by impact shall be provided by use of wire guards or other such devices whenever risk of damage occurs.

13. ELECTRICAL MOTORS

(1) Totally enclosed fan cooled motors to BS4999:Part 105 shall be used.

(2) Motor control and protection circuits shall be as stipulated in BS 6164. The emergency stops for machinery shall be provided

14. **Inspection And Testing.**
Electrical installations on Site shall be inspected and tested in accordance with the requirements of the IEE Wiring Regulations (16th Edition).

15. **Identification**
Identification labels of a type reviewed without objection by the Engineer shall be affixed to all electrical switches, circuit breakers and motors to specify their purpose.

16. **Maintenance:**
(1) Strict maintenance and regular checks of control apparatus and wiring distribution systems shall be carried out by an electrician (duly qualified to carry out the said checks) to ensure safe and efficient operation of the systems. The Contractor shall submit for review by the Engineer details of his maintenance schedule and maintenance works record.
(2) Al lportable electrical appliances shall be permanently numbered (scarf tag labels or similar) and a record kept of the date of issue, date of the last inspection carried out and the recommended inspection period.

17. **Metering**
The Contractor shall install separately metered and invoiced supply or supplies of electricity for: -
(a) Site fabrication facilities;
(b) Site work shops and work yards; and
(c) Site offices and stores.

Appendix - XI – Utilities

DEFINITIONS

1. Utilities:

Utilities are defined as public utilities above or below ground and include all live water mains, sewer mains, water wells, power cables, streetlights, transformers, pillar boxes, telephone posts, telecommunication cables, gravity sewers, storm water drains, gas lines which are either shown on the Employer's Drawings (chartered) or identified on site by the Contractor (uncharted).

1.1 Charted Utilities:

Charted Utilities are the utilities (as defined above) which are shown on the Employer's Drawings.

1.2 Uncharted Utilities:

Uncharted Utilities are the utilities (as defined above) which are not shown on the Employer's Drawings.

1.3 Responsibility of the Contractor.

1.3.1 The Contractor shall make his own enquiries and investigations, including excavating trial holes/pits, to ascertain the existence, nature, location, and size of utilities. A schedule of utility diversions and utilities to remain but to be supported / protected (the utility diversion plan) shall be prepared by the Contractor and submitted.

The schedule will list out utilities that:

- will be diverted by the Contractor during the course of the Works, and
- will remain in place and require the use of specific construction protection methods to complete the underground structures around and below the utilities including support of the utilities during construction by the Contractor.

1.3.2 The Contractor shall take into consideration the time required for utility diversions into the overall Works Programme for the Contract. However, efforts shall be made to avoid diverting/disturbance of any utility and continue the Works by supporting the same but the required services being provided by these utilities shall be maintained at all the times by the Contractor. Any delay to construction works due to delay in Utility diversion work will be responsibility of contractor, no claims shall be entertained in this regard.

1.3.3 The diversion work shall be undertaken by the Contractor as per the approval of the Utility owning Agencies and a notice from the Engineer. Temporary supports and protection by methods proposed by the Contractor and agreed by the Utility Agency shall be provided to the utilities. Permanent supports and protection shall be provided wherever required for the safety and security of the utility service.

1.3.4 The Contractor shall immediately inform the Engineer and the Utility Agencies of any

(h) damage to utilities.

(i) leakage of utilities.

(j) discovery of utilities not previously identified.

1.3.5 When diverting and/or protecting sewerage and storm water lines the Contractor shall ensure that drainage to the site and adjacent areas is maintained at all times and that at no times flooding/overflow or other nuisance occurs.

1.3.6 The Contractor shall inform the Employer/Engineer of the programme of all works of utility diversion/ protection works and shall take all steps to enable the utility diversions to proceed in accordance with the programme. The Contractor shall maintain close liaison with the Utility Agencies. The Contractor shall set up and manage a Utility Liaison Group of experienced personnel for the duration of the Contract.

1.3.7 Records of the existing utilities encountered shall be kept by the Contractor on the Site and a copy provided for the Employer/Engineer. The records shall contain the following details:

(k) location of utility.
(l) date on which the utilities were encountered.
(m) nature and sizes of the utilities.
(n) condition of utility.
(o) temporary or permanent supports provided, and
(p) Diversions made –Temporary or permanent

1.3.8 The Contractor shall include the details (plan, location, ownership, size, and material) of all such utilities on the As Built Drawings.

1.3.9 The diversion/protection of utilities (Charted/Uncharted) shall be covered under the provisional sum given in the Pricing Summary. The Contractor shall be paid as per the current Schedule of Rates of the respective departments (KPWD, IR-USSOR, BWSSB, BESCOM, BSNL, or any other Govt agency etc.) plus 10% for overhead and profit. The priority of reference for deriving rate shall be in the same order as stated above. Until such time as such rate(s) are agreed or fixed, the Engineer, after consultation with the Employer, shall determine the provisional rate(s) to enable IPC to be issued by the Engineer.

1.3.10 Temporary diversion of each utility is allowed for one time. If the utility is to be restored, permanent restoration shall be considered in addition to the temporary diversion.

1.3.11 NOC & Approval of schemes for Diversion of Utilities from the concerned regulatory /statutory/Local Authority is the responsibility of the Contractor in coordination with Employer, Employer will only assist in getting permission and nothing extra is payable on this account. Similarly, necessary precautions which are specified from time to time by the utility owning agencies shall be followed. Contractor should make his own survey for identification of underground/above ground utilities.

2. Diversion and Protection of Underground/Overhead Utility Lines

2.1 The work comprises of replacement, relocation, diversion and protection of existing subsurface, surface and overhead public utilities viz. sewer mains, water lines, water wells, storm water drains, gully pits including connection pipes, house drains, gas pipe lines, electric and telephone cables, optical fibre cables including their appurtenance structure, O.H. electrical transmission line, electric poles, traffic signals, etc. which will be disturbed due to construction of the stations, where applicable.

2.2 The Contractor shall effectively protect all public utilities falling within the stations, station entry & exit locations and their immediate adjoining areas or which are likely to be exposed, disturbed or damaged during the execution of the work or in consequence thereof, in such a manner and using such materials as required or specified by the concerned public Utility Agencies and as per instruction of the Engineer, and hold them in proper position without any damage being caused to them during execution of work. Where adequate spaces are not available adjacent and outside the stations, the utilities may have to be hanged within the station-box itself to facilitate the construction work.

2.3 The contractor shall provide and lay pipes, water wells, gas mains/gully pit connections/house drains and other electric, telephones, copper telecom cable, optical fibre cables and other cables or any other underground structures or services falling within the station and their immediate adjoining areas which may be found to have been disturbed or damaged due to the Contractor's fault and/or defective and careless workmanship. The decision of the Engineer in this respect shall be binding and final and all costs of rebuilding or repairing of such damaged services or structures as foresaid shall be deducted from the Contractor, if the same is not taken care of within a reasonable time frame, mutually agreed between the

Engineer and the Contractor. The claim or penalty imposed by the concerned utility department for the damage of utilities done by the contractor shall be recovered from the Contractor.

2.4 The Contractor shall enquire of and collect information from all concerned public Utility agencies, owners, Government Departments and local bodies in connection with the sewer lines, water mains, water wells, cables, wires and any other obstruction either overhead or on ground or underground which may be encountered in the course of execution of the work and which are likely to affect the progress of the work, at his own cost and risk. No idle labour charge will be admissible on account of delay in collecting the above-mentioned information.

2.5 The Contractor shall have to excavate trial trenches of suitable sizes for satisfactorily exploring all the underground utilities as required and as instructed by the Engineer before commencement of any permanent work below ground level. All works related to utility identification and preparation of drawings obtaining stake holders approval shall be included in the Contractors quoted price. The time of completion for the project is inclusive of diverting and/or protection (temporary as well permanent) of utilities.

3. Additional Conditions for Diversion/Protection of BWSSB Utilities

3.1 It is the responsibility of the Contractor to get the approval of the proposed water/sewer/storm water/ pipeline etc., diversion/shifting from the concerned Agency/Authority. However, Engineer / Employer may facilitate the co-ordination work with concerned agency for getting the necessary approval.

3.2 In case the concerned utility agency/authority maintains a list of registered/approved contractors for undertaking such works and desires such shifting/diversion of pipeline/utility etc. work to be undertaken by such registered/approved contractors, then such shifting/diversion of pipeline/utility etc., shall have to be carried out by engaging the registered/approved contractors.

3.3 In case the Engineers of concerned utility agency intend to supervise the work, the Contractor (or sub-contractors engaged by the Contractor) have to carry out the work as per the instruction of the utility agency during diversion work by the Contractor.

3.4 In case of permanent diversion of water/sewer/storm water/pipelines etc., it is the responsibility of the Contractor to carry out such work without affecting water supply/without affecting sewage disposal etc. If required alternative temporary arrangement shall have to be made by the Contractor without any additional cost.

3.5 In case of temporary water pipe/sewer pumping mains (without manholes) diversion (which means divert the pipeline temporary away from station box and brought back to the original position after completion of station work), it is the responsibility of the Contractor either to use the retrieved diverted pipes or new pipes to restore back the original place without affecting the water supply/utility service.

3.6 In case of temporary diversion of gravity sewer pipelines with manholes are required, the Contractor, initially before taking up the station work has to ensure that the flow is diverted by laying sewer pipeline and constructing manholes away from the station box and then only divert the flow. After completion of station work, the Contractor shall have to lay again another sewer pipelines and again construct new manholes for restoring back to the original place.

3.7 In case of temporary supporting of water/sewer pipelines, if any damages occur during construction period it is the responsibility of the Contractor to rectify the damages to the satisfaction of concerned agency. The cost of the rectification works shall have to be borne by the Contractor.

3.8 It is the responsibility of the Contractor to obtain completion certificate from concerned utility agency for each diversion work. The payment for such diversion work will be made to the Contractor after obtaining completion certificate from concerned utility agency.

3.9 The Contractor shall handover all the retrieved material to the stores of the concerned utility agency/concerned department at the Contractor's cost and submit the proof of handing over.

4. Electrical Utilities (BESCOM/KPTCL)

4.1 The Contractor shall submit the utility diversion programme to Engineer / Employer with diversion justification based on trial pit information.

4.2 The Contractor shall submit the diversion plan to Engineer at least 60 (sixty) days in advance of work commencing to obtain approval from Electrical utility agencies. For utility diversion proposals of BESCOM / KPTCL, the Contractor shall submit diversion justification with trail pit information and drawing(s) with the proposed diversion route(s).

4.3 The Contractor would submit application of diversion works to electrical utility agencies with diversion plans. The Contractor shall render necessary assistance.

4.4 The Contractor shall coordinate with the local officials to assess quantities and specifications of materials required for diversion works. Necessary assistance would be provided by the Employer and the Engineer.

4.5 The Contractor shall obtain necessary permission from the concerned departments/agencies to carry out the diversion/shifting works and get necessary permission from Traffic Police Department.

4.6 Wherever possible, horizontal directional drilling method shall be adopted at location where utility diversion works crosses roadways and require lane closures for excavation to avoid inconvenience to the traffic.

4.7 The electrical utilities diversion/ shifting should be carried out by the Contractors/agencies registered with the electrical utility agencies / KPWD and have the required grade license from the Chief Electrical Inspector to Government. The Contractor should be well acquainted with electrical works so as to maintain the standard. The Contractor shall inform the same to Employer/Engineer for getting consent from the concerned electrical utility agency.

4.8 The Contractor shall identify the quantity of materials required for the contract such that the material can be procured by the Contractor in bulk and in advance to the implementation of the utility diversion works. The quality of materials to be procured shall be approved by the concerned utility agency. Materials used for diversion/ shifting shall be of quality conforming to the applicable standard of the electrical utility agency and as per relevant BIS.

4.9 The source of materials and the guarantee for the materials to be used shall be submitted to Engineer for obtaining approval from the concerned utility agency. Any failure of the material within the guarantee period shall be replaced and installed free of cost by the Contractor.

4.10 Contractor shall inform the local officers/officials of the concerned utility agency about the diversion works at least 15 (fifteen) days before the execution of diversion.

4.11 The diversion / shifting utility work shall be carried out under the direct supervision of officials and the utility agency decision shall be final in this regard. The Contractor shall provide free access to officers/ officials / workman for the purpose of inspection/supervision.

4.12 After restoration of regular service completion certificate shall have to be obtained from the concerned departments/agencies. The regulations for working with utility agencies shall be as follows.

a. The diversion/shifting utility work should be carried out without causing any inconvenience to the operation and maintenance of Sub-Station and other departmental works of the concerned utility agency.

b. The Contractor shall execute and complete the work strictly in adherence to the time schedule and to the satisfaction of the engineers and adhere strictly the direction of the utility agency in any matter.
c. The Contractor shall be responsible to protect the public and the employees of the utility agency against any accident that may arise during the execution of diversion/shifting utility works. The Contractor shall indemnify the Employer for any claims for damages/injuries to the person/property resulting from any such accident. The Contractor shall Compensation Act by the way of obtaining an accident risk type insurance to meet all purpose of relief, failing which or otherwise the Contractor shall be solely responsible for meeting the compensation awarded under the said Act.
d. The Contractor shall undertake to ensure free flow of traffic during execution of the diversion/shifting works and shall be responsible for any accident/loss of lives/property. Damage to the other existing utilities during diversion shall have to be rectified by the Contractor at his own cost.
e. The Contractor shall employ qualified technical personnel to carry out the diversion/shifting of utility works.
f. The Contractor shall apply well in advance for Line Clearance (LC) for carrying out the joint works/shifting works. Employer would authorise the Contractor to take LC from the concerned utility agency. If needed, Employer would provide assistance to the Contractor to get the LC. LC will be given by the concerned utility agency depending upon exigencies, which have to be strictly adhered to.
g. The Contractor shall handover all the retrieved / unused material to the stores of the concerned utility agency /concerned department at the Contractor's cost.
h. Contractor to pay the penalty/charges imposed by the utility agency for damage to the utilities on their own.
i. The Contractor shall undertake not to revoke the above conditions until the completion of diversion/shifting works.

5. BBMP Utilities diversion

5.1 Diversion of Storm water drain shall be carried out as per the design, standard and general specifications of BBMP /PWD/concerned Highways Department.

5.2 The diversion route for storm water drain shall be approved by BBMP /concerned PWD/ Highways Department.

5.3 The invert level of diverting drain shall be maintained on par with upstream/downstream of connecting drains.

5.4 The Contractor shall make alternate arrangements to divert and ensure smooth flow of water from upstream side during construction.

5.5 The Contractor shall provide the adequate sizes of drain or follow the existing sizes as agreed by the concerned agency.

5.6 Diversion of storm water drain shall be carried out through the registered Contractors of BBMP/PWD/Highways Department (if such a list of approved/registered contractors is maintained by the utility agency).

5.7 Streetlights shifting shall be carried out as per the specification of BBMP.

6. BSNL Utilities diversion

BSNL utilities such as copper cable and OFC cables which are likely to be affected to be identified based on trial pit information. Contractor to prepare the diversion plan in coordination with the BSNL utilities agencies and get approval for the diversion plan. Employer/Engineer may provide assistance in this regard. Contractor to assess the required quantities based on the diversion plan. Cables procured to be Quality control checked by the concern wing of BSNL. Contractor to coordinate and arrange for the Quality control check by BSNL Diversion of BSNL utilities to be done by the BSNL approved subcontractors and the completion certificate to be obtained from BSNL for the utility's diversion done. Private Telecom/OFC cable Contractor to manage the existing private telecom and OFC cables.

7. GAIL Utilities diversion

GAIL utilities such as gas pipelines which are likely to be affected to be identified based on trail pit information. Contractor to prepare the diversion plan in coordination with the GAIL authorities / agencies and get approval for the diversion plan. Employer/Engineer may provide assistance in this regard. Contractor to assess the required quantities based on the diversion plan. Contractor to coordinate and arrange for the Quality control check by GAIL Authority. Diversion of GAIL utilities to be done by the GAIL approved subcontractors and the completion certificate to be obtained from GAIL for the utility's diversion done.

8. Indian Railway (IR) Utilities diversion

IR utilities which are likely to be affected to be identified based on trail pit information. Contractor to prepare the diversion plan in coordination with the Railway authorities / agencies and get approval for the diversion plan. Employer/Engineer may provide assistance in this regard. Contractor to assess the required quantities based on the diversion plan. Contractor to coordinate and arrange for the Quality control check by Railway Authority. Diversion of Railway utilities to be done by the Railway approved subcontractors and the completion certificate to be obtained from Railway for the utility's diversion done.

9. General

The Contractor shall provide 6 months rolling programme every 3 month.

Appendix-XII - Contractor's Site Laboratory

1. SITE LABORATORY

(1) The Site Laboratory shall be approximately 250 sqm in area. It shall consist of the following accommodation:

1 concrete laboratory	60 Sqm floor area
Soil laboratory	30 Sqm floor area
2 Office each	15 Sqm floor area
1 store room	10 Sqm floor area
1 kitchen	10 Sqm floor area
Male/Female toilets, changing room & shower	sufficient for 6 persons

(2) The remainder of the 250 sqm shall consist of storage area for concrete cube curing tanks. The laboratory, office etc. shall be in one building; the curing tank storage building may be in a separate building, but if so, it shall be adjacent to the laboratory building & connected to it by a level, weather proof passageway. In addition, an area of covered hard standing of 50 sqm for motor vehicles shall be provided adjacent to the laboratory.

2. STANDARD OF CONSTRUCTION

(1) The laboratory shall be constructed to the best Engineering practice and as approved by the Engineer. Two independent telephone lines with two extensions each shall be provided for the laboratory. Telephones shall be located in areas as agreed with the Engineer.

(2) A watert ank with minimum capacity of 2000 liters shall be installed. Constant water pressure of 15Kpa minimum shall be ensured in each laboratory.

(3) In the case of sinks used for washing samples, adequate trapping and/or separating devices shall be provided to ensure the proper functioning of the facility.

3. FURNISHINGS AND FIXTURES

The contractor's site laboratory shall be provided with required furnishings and fixtures.

4. LABORATORYEQUIPMENT

(1) The laboratory equipment, as listed below, shall be approved by the Engineer. The Contractor shall submit for the Engineer's approval within 2 weeks of the order to commence work the name of the supplier it intends to use for each piece of apparatus together with the relevant catalogue number.

(2) The layout of the equipment in the testing laboratory shall be instructed by the Engineer.The equipment shall be maintained to accuracy appropriate to the required testing methods with routine calibration by an accredited organisation as recommended by the appropriate Authority. Equipment shall also be calibrated after maintenance or relocation.

(3) The Contractor's site laboratory shall be equipped with the following material testing equipment as a minimum.The nature and quality of equipment required for pre-stressing maybe varied by the Engineer depending on the detail of the Contractor's Design and Construction methods or for any other reason which he deems to be valid and necessary for the proper control of quality:

(4) The Contractor shall be responsible for all on-site and off-site testing and for all in-situ testing. All appropriate laboratory tests shall be carried out in the Contractor's laboratory, unless otherwise

permitted or required by the Engineer. Where the laboratory is not appropriately equipped and/or staffed for some tests, or if agreed to by the Engineer, tests may be carried out in other laboratories. All materials required approval of Engineer after 3 rd party test at approved or reputed NABL accrdited laboratory at the discretion of engineer.

(5) Employer / Engineer in charge may recommend any test pertain to work or material to any laboratory of repute if they are accredited for the relevant work to a standard acceptable to the Engineer. The cost of such tests shall be borne by contractor.

Determining Liquid Limit (1 complete set)

Liquid limit device (Casagrande type)	1set
Grooving tools	1No
Evaporating dish	1No
Spatula100mm blade	1No
Laboratory balance, capacity 500gm, (Sensitivity 0.01gms.)	1No
Wash bottle, capacity 500ml.	1No
Moisture cans capacity 50ml.	24No

Determining Plastic Limit (1 complete set)

Evaporating dish	1No
Spatula 100mm blade	1No
Glass plate 250mm x 250mm x 12mm	2No
Moisture cans capacity 50 ml	12 No
Stainless steel rods,3mm dia.	2No

DeterminingMoistureContent(1completeset)

Micro Oven, capacity 35 liters, control temperature upto	200°c
1 No weighing machine, capacity 200gm., sensitivity 0.01gm.	1No
Lab. Toungs	1No
Moisture cans 75ml. with lid	36No

Compaction Characteristics (1complete set)

Standard compaction mould 100mm dia.	1No
Modified compaction mould 150 mm dia.	1N
Standard compaction Rammer,2.5kg.	1No
Modified compaction Rammer,4.5kg.	1No
Straight edge 300mm long	1No
Sample ejector for 100mm and 150mm	1No
Mould Sample tray 60x60x8cm	3No
Wash bottle, 500ml.	2No
Moisture cans 250ml	24No

Density of soilin-place by sand replacement method (2 complete set)

Sand density cone apparatus150ml	2No
Plate,300mm X 300mm	2No
Chisel 25mm X 150mm	2No

Hammer	2No
One gallon's field cans	24No
Sampling spoons	2No
Soft hair brush	2No
Moisture cans 250ml	48No

Sieve Analysis	
Sieve shaker (portable)	1unit Coarse sieves in sizes from
100mm to10mm	(1set Fine sieves #4, #8, #16, #30, #40, #50, #100, #200 each)

Pans & covers

Specific gravity and absorption of coarse aggregate	
Wire basket, 200mm dia Heavy duty suspension balance,	
20kg X 1gm with accessory for weight in water	1set
Suitable water container	1 No.

Unitwt.of aggregate

Balance, 100Kg cap. With 10gm precision	1No
Tamping rod 16mm dia X 600mm long	1No
Measuring containers (3,10,15, 30 ltrs)	1each

Flakiness & Elongation

Flakiness gauge, Elongation Index	1set

SoundnessTest

Sodium Sulphate	25Kg
Soaking Tank	1nos
Balance, Cap. 3Kg, sensitivity 0.1gm	1set
Sieves: coarse, Fine	1set

Concrete

Bickets for concrete sampling	12Nos
Slump Cone	12Nos
Tamping rod	12No
Base plate	12No
Mixing pan for concrete	2No
Scoop for general purpose	2No
Concrete thermometer	2 No
Concrete cylinder mould 150mm*300mm;	
100mm*300mm	10each
Concrete cube mould,100mm cube &150 mm cube	10each
Adjustable spanners for Dismantling cube moulds	6No.
Capping set	2No

Capping compound
Concrete curing tank with capacity for 270 cubes, temperature controlled, with circulation system drain and lockable cover 5No.
Schmidt test hammer 1No.
Compression testing machine (simple hand operated) 1 No.
Mould oil Temperature chart recorder 1No.

Miscellaneous

Vernier callipers to measure up to 200 mm, with elongated jaws	5 Nos
Steel rule, 300mm long graduated	2Nos
Rubber gloves	10Pair
Cotton working gloves	20Pair
First aid kit	1set
Wire brush	6Nos
Steel tape, 3m, 5m, 30m	3each
Ball peen hammer,1kg	2Nos
Paint scraper.Approx.100mm wide	8Nos
Float, steel Approx. 280 x120mm	8Nos
Sack barrow	1No
Shovel: Square Mouthed	2Nos
Round Mouthed	2Nos

24-wheel trolley, heavy duty, approx. 0.7m X 1.0m long Pneumatic tyred type 1no
Wheelbarrow, rubber tyred
Comprehensive tool kit 1no

Claw hammer, multi-grips, spanners (adjustable)	1No
Type NR Schmidt Hammer and tester with recording device	1No
Testing Anvil for Schmidt Hammer test (SHT)	1No.
Chart recording paper for SHT	10 pkts
Cover meter for detecting metal objects to depth of 100mm	
Below the surface of non-magnetic objects	3 No.
Noise meter	1 No.
RCPT Testing Machine	1No.

Permeability Testing Machine.

Appendix XIII - Project Interface Matrix

Type		Interface RACI Matrix								
		Scope of Services / Works	BSRP System Contractor	Track Work Contractor	Rolling Stock Contractor	Civil Works Contractor				Depot
						Stations	Tunnel (DELETED)	Viaduct/At-Grade	Architectural and MEP (station)	
A		**Civil Works**								
B		**Civil Works Elevated & At-Grade sections**								
	1	Mechanical, Electrical & Plumbing (MEP)								
		a. Low voltage electrical distribution	Interface 1	Interface 2		Lead		Interface 2	Interface 1	
		b. Lighting	Interface 1			Lead		Interface 2	Interface 1	
		c. Lightning protection	Interface 1			Lead		Interface 2	Interface 1	
		d. Station HVAC	Interface 1			Lead			Interface 1	
		e. Drainage system	Interface 2	Interface 2		Lead		Interface 2	Interface 2	
		f. Fire fighting	Interface 1			Lead		Interface 2	Interface 1	
		g. Plumbing	Interface 2			Lead		Interface 2	Interface 2	
	2	Rooms for Railway Systems equipment	Interface 1			Lead			Interface 1	
	3	Cable routes and ducts	Interface1	Interface 2		Lead		Interface 2	Interface1	
	4	Conduits for cables under track	Interface 1	Lead		Interface 2		Interface 2	Interface 1	
	5	Construction & maintenance shafts (for Railway Systems)	Interface 1			Lead		Interface 2	Interface 1	
	6	Earthing and Bonding	Interface 1	Interface 2		Lead		Interface 2	Interface 1	
	7	Review Design of AC, False ceiling, False flooring, along with Earthing	Interface 1			Lead			Interface 1	
C		**Civil Works Depots and Workshops**								
	1	Mechanical, Electrical & Plumbing (MEP)								
		a. Low voltage electrical distribution	Interface 1							Lead
		b. Lighting	Interface 1							Lead
		c. Lightning protection	Interface 1							Lead
		d. Station HVAC	Interface 1							Lead

Type		Interface RACI Matrix								
		Scope of Services / Works	BSRP System Contractor	Track Work Contractor	Rolling Stock Contractor	Civil Works Contractor				Depot
						Stations	Tunnel (DELETED)	Viaduct/At-Grade	Architectural and MEP (station)	
		e. Drainage system	Interface 2	Interface 2						Lead
		f. Fire fighting	Interface 1							Lead
		g. Plumbing	Interface 2							Lead
	2	Rooms for Railway Systems equipment	Interface 1							Lead
	3	Cable routes and ducts	Interface1	Interface 2						Lead
	4	Conduits for cables under track	Interface 1	Lead						Interface 2
	5	Earthing and Bonding	Lead	Interface 2						Lead
D		**Track Works**								
	1	Slab track, switches and crossings	Interface 1	Lead		Interface 2		Interface 2		Lead
	2	Recesses for point machines	Interface 1	Lead		Interface 2		Interface 2		Lead
	3	Buffer stops	Interface 2	Lead		Interface 2		Interface 2		Lead
	4	Switch machines	Interface 1	Lead						Lead
	5	Slab end anchor blocks in earthworks		Lead		Interface 2		Interface 2		Lead
	6	Shear connector		Interface 1		Lead		Lead		Lead
	7	Track support level in stations		Interface 1		Lead				
	8	Earthing and Bonding	Interface1	Interface 2		Lead		Lead		Lead
E		**BSRP Systems**								
	1	Signalling	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
	2	Telecommunications								
		a. Fiber optic backbone system	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		b. Integrated Radio System	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		d. Public and Safety Radio systems	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		e. Passenger Information System	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		f. Safety and security System	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		g. Fire Detection	Interface 1	Interface 2		Lead		Interface 2	Lead	Interface 2

Type		Interface RACI Matrix								
		Scope of Services / Works	BSRP System Contractor	Track Work Contractor	Rolling Stock Contractor	Civil Works Contractor				Depot
						Stations	Tunnel (DELETED)	Viaduct/At-Grade	Architectural and MEP (station)	
		h. Other telecommunication equipment, Tetra radio Tower	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
	3	Energy								
		a. Auxiliary Power Substations	Lead		-	Interface 1		-	Interface 1	Lead
		b. Medium voltage cable networks	Lead			Lead		Interface 1	Lead	Lead
		c. Station Power Supply system (ASS)	Lead		Interface 1	Lead		Interface 1	Lead	Interface 1
		d. Uninterruptible power supplies E & M	Interface1			Lead		Interface 1	Lead	Lead
		e. OHE System	Lead	Interface 2	Interface 1	Interface 1		Interface 1	Interface 1	Interface 1
	4	SCADA								
		a. Bulk Power Substations	Lead			Interface 1		Interface 1	Interface 1	Interface 1
		b. Station Power Supply	Lead			Interface 2		Interface 2	Interface 2	Interface 2
		c. SCADA Cabling	Lead			Interface 1		Interface 2	Interface 1	Lead
		e. Communications networks	Lead			Interface 2		Interface 2	Interface 2	Interface 2
		f. Servers	Lead			Interface 2		Interface 2	Interface 2	Interface 2
		g. BAS/BMS	Lead			Interface 1			Interface 1	Interface 1
	5	Tunnel ventilation system								
	6	EMC requirements								
		a. Stray current corrosion protection	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
		b. Earth Mat (station earth)	Interface 1			Lead		Lead	Lead	Lead
	7	Platform Screen Doors	Lead		Interface 1	Lead		Interface 2	Lead	Interface
	8	Automatic fare collection	Lead	Interface 2		Interface 2		Interface 2	Interface 2	Interface 2
F		**Rolling Stock**								
	1	Wheel - rail compatibility		Interface 1	Lead					
	2	Wheel guide force of leading axle		Interface 2	Lead					
	3	Standard axle configuration		Interface 2	Lead					
	4	Braking and traction forces		Interface 2	Lead					

		Interface RACI Matrix								
Type		Scope of Services / Works	BSRP System Contractor	Track Work Contractor	Rolling Stock Contractor	Civil Works Contractor				Depot
						Stations	Tunnel (DELETED)	Viaduct/At-Grade	Architectural and MEP (station)	
	5	Shape factor for standard vehicles		Interface 2	Lead					
	6	On-board equipment Railway Systems (ATP/ATO etc.)	Lead		Lead					
	7	Service trains	Interface 2		Lead					
G		**Fire and Safety**								
	1	Emergency service communication	Lead		Interface 1	Lead		Interface 2	Lead	Interface 2
	2	Signage provision	Lead		Interface	Lead			Lead	
	3	Solar panel provision	Interface		Interface	Lead			Interface 1	

Legends:
Lead: Responsible for leading the interface coordination with the Engineer's representative, accommodating the design requirements of "Interface 1" and "Interface 2" parties into their construction or equipment
Interface - 1: Exchange of information necessary to specify the interface.
Interface - 2: Incorporate requirements, provide openings, build in parts, conduits, etc. (to be provided by the originator) if not already specified elsewhere in the contract.

Note: The Station Contractor is required to obtain detailed requirements from various Project Partners (S&T, AFC, PSG/PSD, Rolling Stock, Signage, Track, Solar Power, Lift & Escalators etc.,.) and incorporate the same in their Civil Design. The Construction shall be carried out by the Stations Contractor after confirmation of the requirements by the designated Project Partners and approval of the Engineer.

Annexure – I : Right of Access to the Site

Time for access to, and possession of the Site

The Right of access shall be handed over progressively, generally taking into account the approved program of works.
The Right of Access to the site for two (2) stations will be handed over within thirty (30) days from the Commencement Date.

The schedule Right of Access of remaining stations will be given progressively and in line with the requirement of the approved Programme. If any delay in access to, and procession of the site, the extension of time as per relevant clause of contract shall be given for the delay of effected portion of the works.

The Contractor shall bear all costs and charges for special and/or temporary rights-of-way which he may require, including those for access to the Site. The Contractor shall also indicate the, extra railway land or Govt land or private land beyond what is shown in the tentative tender drawing with the view to achieve best fit alignment for improved operational efficiency. On review by Engineer and Employer, the Contractor will be advised with the approved Horizontal/Vertical alignment for permanent works. For additional land if needed by the Contractor beyond the right of way the same shall be arranged by the contractor at his own cost.

In case any operation connected with traffic necessitates diversion, obstruction or closure of any road, railway or any other right of way, the proposal is to be developed by the contractor for review for the approval of the Engineer/Employer and the consents and approval of the concerned authorities shall be obtained well in advance by the Contractor.

Provided that if it is found necessary for the Contractor to move one or more loads of heavy constructional plants and equipment, materials or Pre-constructed units or parts of units of work over roads, highways, bridges on which such oversized and overweight items that are not normally to be moved, the contractor shall obtain prior permission from the concerned authorities.

Payments for complying with the requirements, if any, for protection or strengthening of the roads, highways or bridges shall be made by the contractor and such expenses shall be deemed to be included in his quoted contract price.

Further Refer to Section 7, Clause 4.31 of PCC for details.

Annexure – II : Alignment Plans (GAD)

The proposed tentative alignment plan of the BSRP line is attached, for reference and guidance. This is based on survey conducted by the Authority. The Contractor is required to validate and modify the plan and profile of the alignment so as to get the best fit designed alignment to achieve improved operational efficiency as per SOD within the Right of Access boundaries, with the approval of Engineer/Employer.

In addition, the possibility of reducing BSRP corridors to the extent SOD permits also shall be explored to optimize the land requirement.

Annexure – III : Tree Cutting and Forest Clearances–in Process

The permission for obtaining tree cutting / translocation is in progress with BBMP and Forest Department. The tree numeration list and joint inspection with Forest officers / BBMP / TEC is in progress.

Tree cutting, preservation and disposal (or) Translocation along the alignment for cutting / disposal / translocation / afforestation (as per the norms of Forest Department) in lieu of cutting / translocation to be arranged by Contractor at her / his own cost. The applicable permits / permissions for felling of tress / Translocation shall be arranged by Employer. The tree cutting and disposal is included in the scope of work. The cut trees will be the property of the contractor. However, the contractor shall deposit an amount not less than Reserve Price of the trees (as fixed by Forest Department / BBMP) plus FDT (Forest Development Tax) to KRIDE for onward transmission to Railways / BBMP / Forest Department, as the case may be.

Annexure – V : Applicable Permits

i. Applicable Permits

1.0 The Contractor shall obtain, as required under Applicable Laws, the following Applicable Permits:

(a) Permission of the State Government for extraction of boulders from quarry;
(b) Permission of Village Panchayats and Pollution Control Board for installation of crushers;
(c) Licence for use of explosives;
(d) Permission of the State Government for drawing water from river/reservoir;
(e) Licence from inspector of factories or other competent Authority for setting up batching plant;
(f) Clearance of Pollution Control Board for setting up batching plant;
(g) Clearance of Village Panchayats and Pollution Control Board for setting up asphalt plant;
(h) Permission of Village Panchayats and State Government for borrow earth; and
(i) Any other permits or clearances required under Applicable Laws.

Annexure – VI : Provisional Certificate

1 I/We, ……. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated ……. (the "**Agreement**"), for construction of the ..... section (km ..... to km ……) in the State of ..... in .....- ..... BSRP (the "**BSRP Project**") on Engineering, Procurement and Construction (EPC) basis through …… (Name of Contractor), hereby certify that the Tests in accordance with the Agreement have been undertaken to determine compliance of the BSRP Project with the provisions of the Agreement.

2 Certain minor works are incomplete and these are not likely to cause material inconvenience to the Users of the BSRP Project or affect their safety or the movement of rail traffic in any manner. These works have been specified in the Punch List appended hereto, and the Contractor has agreed and accepted that it shall complete all such works in the time and manner set forth in the Agreement.

3 In view of the foregoing, I/We am/are satisfied that the BSRP Project from km ..... to km ..... can be safely and reliably placed in service of the Authority for railway freight and passenger traffic, subject to authorisation by the Commissioner of Railway Safety in accordance with Applicable Laws. In terms of the Agreement, the BSRP Project is hereby provisionally declared fit for entry into operation on this the ……. day of ……. 20…...

ACCEPTED, SIGNED, SEALED
AND DELIVERED
For and on behalf of
CONTRACTOR by:
(Signature)

SIGNED, SEALED AND
DELIVERED
For and on behalf of
AUTHORITY's ENGINEER by:
(Signature)

Annexure – VII : Completion Certificate

ii. I/We, …… (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated …… (the "**Agreement**"), for construction of the .....section (km ..... to km .....) of …… in the State of ..... in .....- ..... BSRP (the "**BSRP Project**") on Engineering, Procurement and Construction (EPC) basis through ……. (Name of Contractor), hereby certify that the Tests in accordance with the Agreement have been successfully undertaken to determine compliance of the BSRP Project with the provisions of the Agreement, and the authorisation by the Commissioner for Railway Safety under Applicable Laws has been obtained.

iii. It is certified that, in terms of the aforesaid Agreement, all works forming part of Railway Project have been completed, and the BSRP Project is hereby declared fit for entry into operation on this the …… day of …… 20…..

i. The test on completion of civil works shall also include the integrated testing. The objective of the contract is the Design and construction, testing and commissioning of the permanent works, construction and removal of the Temporary Works and the rectification of defects appearing in Permanent Works by the contractor in the manner stipulated by the Contract..

ii. The completion certificate is as per railway standard format. Please refer Cl.30.6 at page 161, para 12 and para 2 . The format can be altered as per the contract conditions. The tender conditions prevails.

SIGNED, SEALED AND DELIVERED
For and on behalf of the Authority's Engineer by:
(Signature)
(Name)
(Designation)
(Address)